American Machinist

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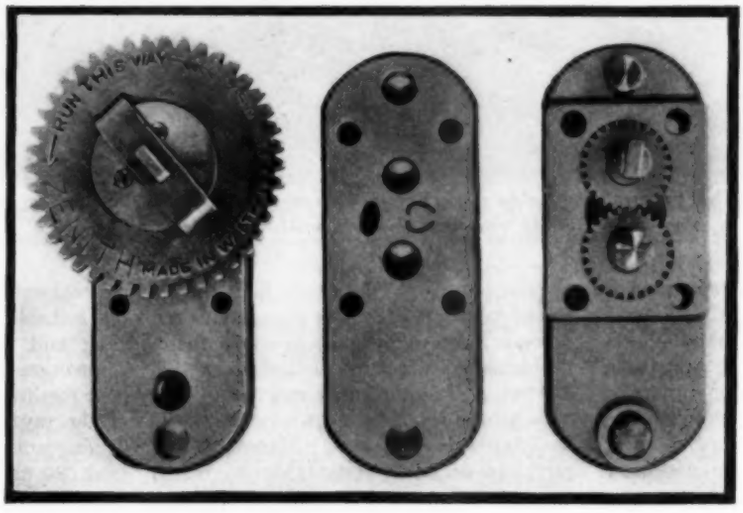


Fig. 1—Design and construction of the gear pump which forces the viscose through the dies that make it into threads for rayon fabrics

"Quarter-Tenth" Tolerances on Rayon Pumps

FRED H. COLVIN
Editor, American Machinist

EVERY WEARER of rayon, or similar materials, realizes the improvements that have been made in recent years, but he does not know how much of this improvement depends on the careful, painstaking work of a small shop in Waltham, Mass. For, besides the improvement that the chemists have made in the material itself, much of the credit for the better quality of the woven fabric is due to the development of the small rotary gear pump used in forcing the liquid viscose through the tiny orifices that form it into threads that rival the product of the silk worm.

Gear pumps have been used for years to force oil or other coolants in machine shop work and for other purposes. But in none of these uses has great accuracy been a prime factor. In the making of threads for rayon, however, accuracy assumes almost unheard of importance. Beginning with gear pumps of usual design and accuracy, as the simplest method, irregularities in the thread diameter immediately developed. These were because of varying volumes and pressures arising from inaccuracy in the gears and in the cases of housings which held them. And no improvements in design or accuracy made at that time gave satisfactory results. Gear pump makers threw up their hands and abandoned the field to the plunger pump, which gave better results but had plenty of troubles of its own.

Then someone brought the problem to the attention of W. H. Nichols, of Waltham, who, as one of his friends put it, "gets his main enjoyment in life by doing something that can't be done." With a wide and varied experience, a shop well equipped with high class machines, and the desire to lick any new problem, he tackled the job back in November, 1925. Accuracy of gear teeth, uniform thickness and concentricity of gears and uniform gear chamber clearance were all serious problems and had to be tackled one by one. These problems included both design and workmanship as will be seen.

Success or failure of a product may be a matter of design, of materials, or of workmanship, or of all three. The Zenith metering pump is the result of all these plus research and more than thirty years of experience in obtaining unusual accuracy on commercial prod-

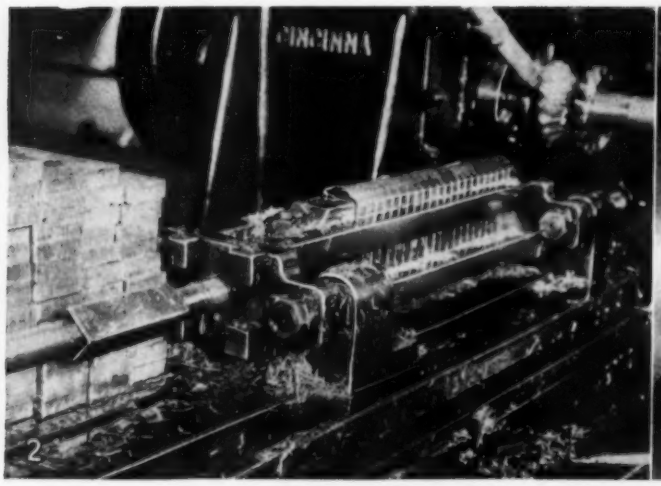


Fig. 2—This type of vise holds work firmly with no tendency to "buckle" in the center.
Fig. 3—Grinding rest that insures uniform bevel on the edge

ucts. Starting with the handicap of a discredited type of pump, Mr. Nichols studied the problem, made many experiments, and designed a geared pump with many novel features. The pump is shown in Fig. 1. Tests showed that a slight but steady flow of viscose over all the moving surfaces was necessary to prevent wear. So the pump was designed to permit the minimum leakage and to maintain it constantly by making the pump to closer tolerances than had ever been done on a commercial product. The viscose is automatically wiped from the ends of the shafts, the amount of leakage being controlled. The "eyebrows" shown on the side plate permit a small amount of viscose to escape over the faces of the gears and to the outside through the open end bearings, the clearance being held to 0.0003 in. between plate and shaft. The leakage does not affect the delivery, this being controlled by the side clearances of the gears, which ranges from 0.0003 to 0.0001 in. depending on conditions existing in the different rayon plants.

Pumps are regularly made to deliver pressures up to 1,000 lb. per sq.in. and at speeds of from 5 to 30 r.p.m., with the delivery of each pump guaranteed within 1 per cent of normal. The normal, it is interesting to note, is 0.587 cc. per revolution, regardless of changes of viscosity or delivery pressure encountered in the rayon mills.

Taking a form of pump which had been discarded because of what were supposed to be inherent defects, and by redesign, plus extreme precision in manufacture, forcing its re-acceptance in an industry, borders on fiction. And radically changing the materials used after having staged a comeback with both success and improvement, was a real achievement.

Originally made of cast iron, the decision to use steel involved a number of problems, all of which had to be solved before it became a manufacturing process. The many ways in which these problems were met and licked show the ingenuity, training and character of the man behind the guns known in the trade as "Accurate Nichols." Many of the methods used are adaptable to other lines of work. Some, whose experience with tenths has been largely confined to conversation about accuracy, will doubt, openly or otherwise, some of the statements made. But a visit to the plant and a careful study of the methods of both manufacture and measurement will dispel all doubts, and confirm the belief that this represents one of, if not the most, accurate pieces of commercial work yet produced.

All the parts are now heat treated and carburized in American Gas Furnace Company rotary furnaces, using carburizing material found best suited to this work and the steel used. In quenching it has been found that heating the oil to 100 to 120 deg. F. gives better results.

The standard pump consists of two side plates and a center plate of alloy steel, drawn with beveled corners. These are approximately $\frac{5}{8}$ and $\frac{1}{4}$ in. thick and can be seen in Fig. 1. Running in the center plate are two gears approximately 1 in. in diameter mounted on suitable shafts. One shaft has a tang and is driven through a flexible connection by the gear outside. This gear meshes with a gear on a drive shaft of the rayon thread machine, the shaft driving any number of pumps desired at from 20 to 30 r.p.m. It is this slow speed, together with the small deviation permitted as to the quantity pumped, that makes necessary the extreme accuracy in manufacture.

The side plates are cut off in lots of nine by an automatically operated power hack saw in which both speed and long saw life have been secured. The next step is to round the ends with a form mill as in Fig. 2. This operation is particularly interesting because of the form of vise used. It consists of four bars which centralize the plates and an end screw to clamp them. These bars and end pieces make it possible for a light pressure on the screw to hold the work firmly because the spring so common in the usual type of vise jaws is missing in this construction. The solid clamping helps to get increased feed and cutter life. The corners are then beveled by grinding, using the type of rest seen in Fig. 3, which makes it easy to maintain the same bevel as the sides. A special pump for high pressures, uses a

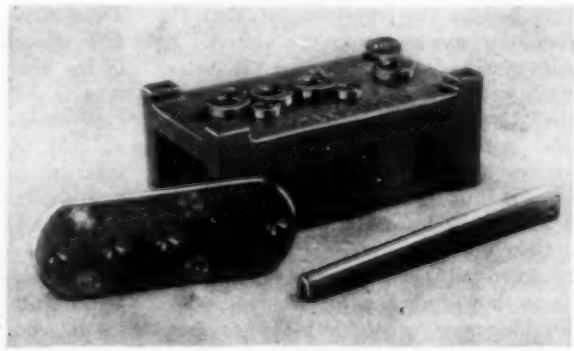
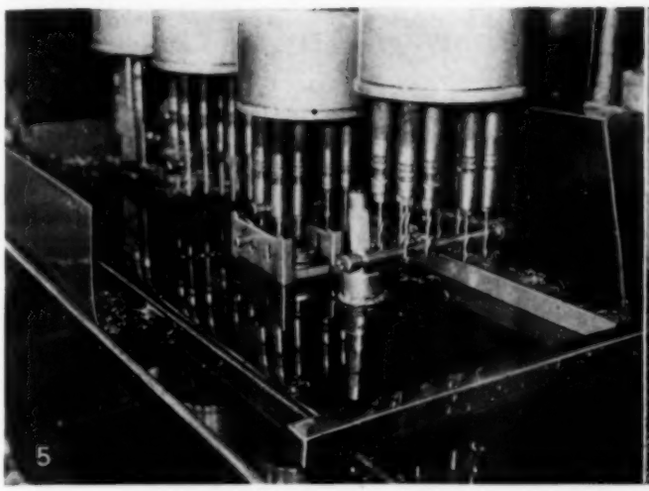


Fig. 4—Simple type of drill jig that utilizes a wedge for holding work in position. Large holes are simply spotted and finished without jig



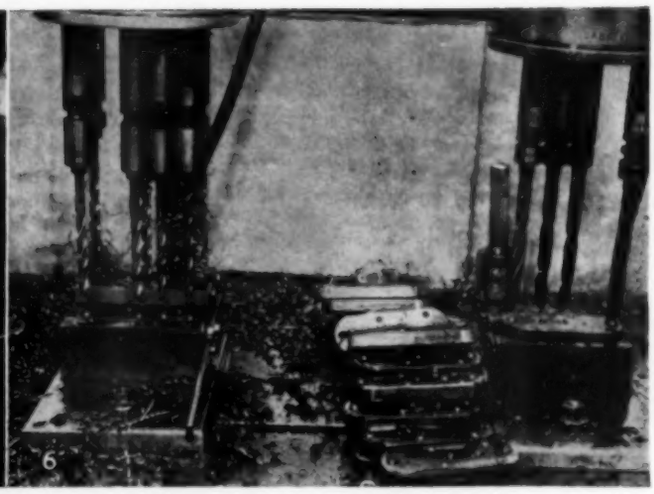


Fig. 5—Drill jigs in use. They are made with feet for use in two positions and flooded with lubricant. Fig. 6—Drilling side plates after being spotted in the jig

bar of egg section which is cut off and beveled in the same way.

Drilling follows, in jigs of very simple design, as in Figs. 4 and 5. This jig is hardened all over, the holes for the drill bushings being kept soft by protective methods. After hardening, the bushing holes are finish bored with center distances carefully maintained. A taper key wedges the plate in place, the action of the key forcing the plates aaginst hardened locating pins. The four small holes that hold the center plate are drilled through. One side plate is tapped and the other countersunk for the clamping screws as in Fig. 5, which shows the same jig the other side up. This also shows the way in which the oil pipes are run between the drills and keep the drills flooded.

The four centerline holes, the outer holes being for dowels and the center holes for gear shafts, are only started in the jig as can be seen in Fig. 4. It has been found better to finish the hole without the jig bushings, this being done in the open jig, Fig. 6. The jig at the left holds two side plates, both being located by the single lever.

Passages for the flow of viscose are drilled in the jigs in Fig. 7. These take care of the angles necessary to make smooth passages and avoid pockets which interfere with the free flow of viscose, uniform flow being an all important factor. The new type of deep hole drill with its special flutes and points is used very successfully in these holes.

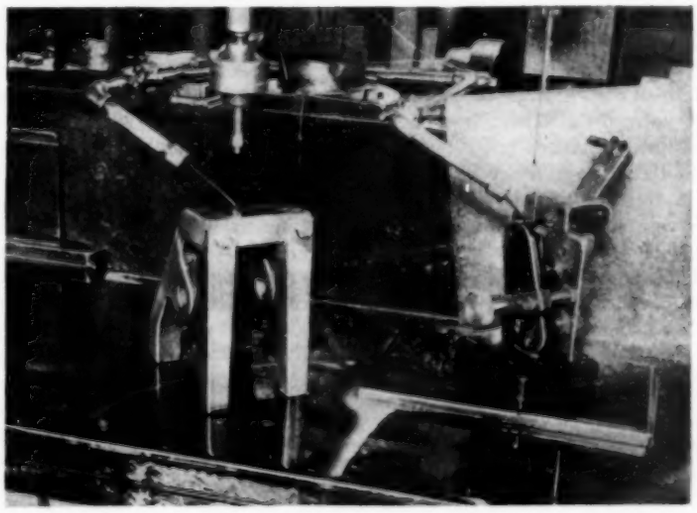
The viscose comes in at the beveled hole on one side plate, Fig. 1, goes through the pump and out of a similar hole in the other plate. The bevel of these holes must be smooth, and accurate as to angle, as the connections are simply pressure contacts.

After drilling, the side plates are heat treated and then ground on one side. A similar operation is shown in describing the making of the center plates.

Accurate spacing of the four centerline holes is essential. Those at each end are dowels and the two others are for the gear shafts. The close tolerances of the gear shaft centers and their location, make necessary the single point boring operation seen in Fig. 8. This machine utilizes the base and some of the mechanism of an automatic milling machine. With the side plate located in a simple work holder, it feeds automatically over the boring tool and returns, then indexes. Starting with an end hole, it comes back to this position after every hole, in this way eliminating an accumulation of errors between hole centers. A T-C tool is used in boring.

Following the single point boring of the four holes, and after carburizing and hardening, the plates go to the special grinding machines, built on the same kind of a base as the machines that do the boring. The spacing mechanism is the same as in boring but special grinding heads have been built, having a planetary wheel spindle, and so driven as to relieve side pull on the grinding spindles. The machine used will be illustrated in connection with the center plates, the only difference being in the holding of the piece and the spacing of the holes.

Fig. 7—More simple jigs for drilling passages in plate for flow of viscose



Lapping

After the plates have been finish ground following the heat treating in gas furnaces, they come to the Norton, (Bethel-Player) lapping machines. Commercial lapping to the accuracy required in these pumps is one of the newer arts growing out of the experiences with gage blocks. The development of lapping machines in which the laps are practically self-correcting, and which simulate the movements of hand lapping and go it one better, has made possible

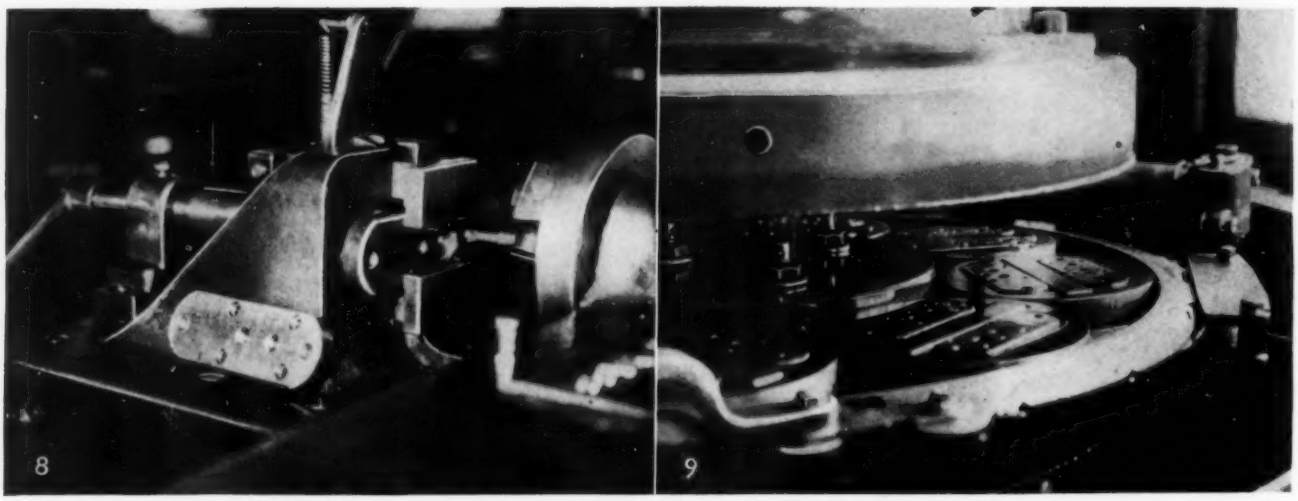


Fig. 8—Boring holes for gear shafts in special machine with single point tool to insure accurate center distance. Fig. 9—Lapping side plates. Each rotating holder carries four plates with felt pads between. The upper and lower laps each work on two plates at the same time

greater accuracy than ever before. And in this connection it is interesting to note that this is a job where the man of settled years and habits shines. With a general background of shop experience which includes an appreciation of the necessity for care, and of reliability, men of 70 or over are not beyond the pale.

The inner side of the side plates are lapped as in Fig. 9, using the special holders shown. Each holder takes two pairs of plates, with a felt pad between. This makes it possible to lap four surfaces at once in each of the eight holders, to gage block flatness. The holders revolve around their own axis and at the same time travel around on the laps in an eccentric path, utilizing the entire face of the laps. The plates are also reversed and put into different holders so as to equalize the lapping action. The result is an extremely accurate flat surface, which forms one side of the gear chamber when the pump is assembled.

This method corrects irregularities and secures surfaces that are surprisingly flat, as checked by the optical flat. Lapping pressure is also varied, being less than half the original in the final lapping. The speed with which good lapping can now be done would have been incredible a few years ago. The advance in the art reflects credit on the machine, the builder, and the user.

A second article will discuss the remaining operations and assembly.

Cylinder Bores Once More—Discussion

M. P. DALTON
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In discussing John R. Godfrey's contribution in Seen and Heard (*AM*—Vol. 77, page 666) James McIntosh in an article under the title given above (*AM*—Vol. 77, page 808) describes a method of grooving flanges to retain the packing material. At the end of his article, Mr. McIntosh wants to know why cylinders should not be bored so as to leave grooves for retaining oil.

The faces of flanges differ much from the bores of cylinders. It is very doubtful if the grooving had anything to do with retaining the packing. The real reason for the good sealing effect was that the comparatively deep grooves formed what hydraulic engineers call labyrinth packing. The leaking fluid expands as it reaches each groove and this causes a drop in pressure. Before the fluid can reach the outsides of the flanges, practically all pressure has been lost. Such a device owes nothing to lubrication and is of no use in the ordinary cylinder where the width of the piston rings controls conditions. But in cylinders having long pistons not fitted with rings the concentric grooves are an effective seal.

The important effect of sharp, narrow grooves in cylinders of gasoline engines is that with tight initial fitting of the pistons the surface beds down rapidly and well, owing to the collapse of the ridges between the grooves.

J. T. TOWLSON
London, England

In an article under the title given above (*AM*—Vol. 77, page 808), James McIntosh offered a description of a method of facing flanges with a single-pointed tool to retain the packing material. At the end of his article, Mr. McIntosh wants to know why cylinders should not be bored in the same way, leaving fine grooves for retaining the oil.

I vote enthusiastically for this method, which I term "feed grooving," not only for cylinders but for all kinds of bearings, both large and small. My vote is based on an experience of quite fifty years ago, at which time I was foreman of a large high-speed engine works. It was proposed to run a single-pointed tool through the otherwise-finished cylinders in both directions, taking a cut $\frac{1}{32}$ in. deep at a lead of 1 in. Although this feed grooving diminished the bearing surface for the piston, the proponents believed (and their belief was fully justified) that the reduction in bearing surface was fully compensated for by the greatly improved penetration of the lubricant.

It was contended that such grooving was just as necessary for efficient lubrication as are helical grooves in bearings, and no one would venture to run a shaft in bearings that had no oil grooves. By such reasoning, a smooth, ungrooved cylinder is far more prone to be swept dry than is one in which a reservoir of oil is automatically maintained by the feed grooves. In cylinders less than 24-in. bore, and with pistons having proportionately narrow rings, a corresponding decrease was made in the pitch of the grooving.

The reader is asked to accept it as true that engines having cylinders grooved as told above, although built 50 years ago, are running today, and the cylinders have never needed reboring. The secret of this longevity lies in the fact that the pistons were abnormally long and were without rings.

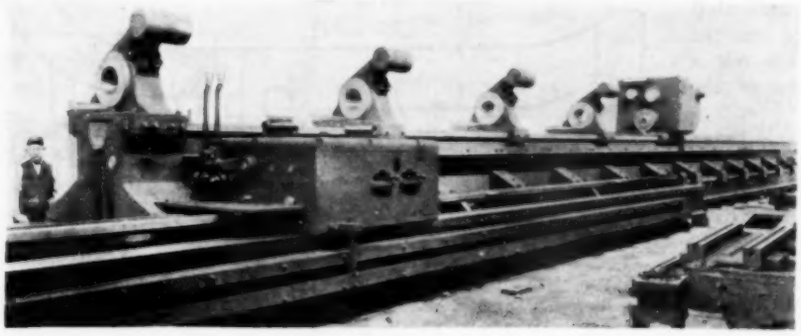

Fig. 1—A close-up of the boring bench shows its feed and traverse gearbox, the boring bar supports and the boring-bar drive box

Gear Ratios on a Gun Lathe

M. M. McCALL

Keeping boring bar supports equidistant from each other and the drive box raises a nice problem in gear trains

TO THOSE acquainted with the design, the unique method of providing movement to the boring bar of the Bement gun boring and turning lathe has been a subject of interest. I know of no similar application. The machine has a 120-in. swing and will finish turn and bore guns up to 20 in. bore and 87 ft. in length. The boring bar is fastened to the front end of a driving spindle extending from the boring bar drive box in the rear.

The square shaft in the foreground of Fig. 1 transmits the feed from the headstock. Suitable feeds are selected by gearing in the gear box attached to the boring bench, and the feed is transmitted to a long screw extending the entire length of the boring bench. A nut attached to the boring bar drive box causes it to move and thereby to feed the boring bar. A motor mounted on the feed and traverse gear box supplies rapid power traverse to the boring bar through the feed mechanism, with which it is interlocking.

The front boring bar support is fixed at the forward end of the boring bench. The other three supports are movable along the boring bench by means of a rack attached to the bench. The rack gears are driven from the screw through helical gears, in mesh with the screw, and gear trains of proper ratio so that the supports move at varying speeds with respect to each other and maintain equal distances from each other, from the fixed support in front and from the drive box in the rear. This design provides supports for the boring bar at equal distances for any position of the bar.

Let us check the gearing on the front moving support shown in Fig. 2. The boring bench screw has a pitch of ¾ in. and a lead of 2¼ in. with three threads. Assuming one revolution of the screw we have $\frac{3}{29} \times \frac{10}{1} \times \frac{3}{4} = 0.7758$ in. movement of the support along the bench. We see however on the drawing that the movement is only 0.5769 in. Evidently we overlooked something in our figures.

A closer study of the drawing reveals the fact that as the rack gear rolls along the rack, the helical gear in mesh with the screw also rolls along the screw because the screw has no longitudinal movement. As the rolling motion of the helical gear along the screw is in the opposite direction to the motion imparted to the helical gear by the rotation of the screw, we find that this rolling motion retards the movement of the support along the boring bench. The rack gear referred to above is the 10-tooth gear as the 59-tooth gear actually in mesh with the rack serves only as an idler.

Since the resultant movement of the support depends on both the rotation of the screw and the rolling of the helical gear on the screw, we will consider the action of each separately to simplify the problem. First, we will assume that the screw moves along with the support during its one revolution. The support will therefore move $\frac{3}{29} \times \frac{10}{1} \times \frac{3}{4} =$ 0.7758 in. along the bench. The screw has also moved 0.7758 in. from its position, so we next push the screw back to its former position without turning it. As we do so the teeth will act as a rack and cause the helical gear to rotate. This in turn will cause the rack gear to roll along the rack toward its former position taking the support with it. We find however that when the screw has been moved 0.7758 in. back to its original position, the support has moved only part way back. The distance from this final position to its starting position before the rotation of the screw is the movement of the support for one revolution of the screw.

In Fig. 3, we represent at *A* a gear in mesh with a fixed rack below and a movable rack above. The gear has a pitch circumference of 30 in. Suppose we move the rack to the left until the gear has made one revolution. This will cause the gear to travel 30 in. along the fixed rack. While turning the gear through one revolution, the movable rack will move a distance of 30 in. from the gear, and as the gear has itself moved 30 in., the total movement of

the movable rack with respect to the fixed rack will be 60 in. as indicated by the two positions marked on the rack. To illustrate this action roll a pencil on the table by means of the palm of the hand.

In Fig. 3 *B* the movable rack is in mesh with a gear 30 in. in circumference which is keyed to a gear 10 in. in circumference in mesh with the fixed rack. Suppose we move the rack to the left until the 30-in. gear has made one revolution. The 10-in. gear will also make one revolution and move a distance of 10 in. along the fixed rack. While turning the 30-in. gear through one revolution, the rack will move a distance of 30 in. from the gear, and as the gear has itself moved 10 in. the total movement of the movable rack with respect to the fixed rack will be 40 in.

In Fig. 3 *C*, the 10-in. gear is in mesh with the movable rack and the 30-in. gear in mesh with the fixed rack. In this case with the same total movement of the movable rack, the movement of the gears is three times as much as in Fig. 3 *B*.

From the above illustrations it is evident that the additional movement of the rack over the movement of the gears, equals the ratio of the gear in mesh with the movable rack to the gear in mesh with the fixed rack, times the movement of the gears along the fixed rack.

Referring again to the gearing on the front moving support, we let X equal the distance the support moves when the screw is returned to its position. Then 29/10 X will be the additional movement of the screw. As the movement of the support plus the additional movement of the screw equals the entire movement of the screw:

$$X + \frac{29}{10} X = 0.7758$$

and

$$X = 0.1989$$

Subtracting 0.1989 from 0.7758 we obtain 0.5769 in. the actual distance the support moves during one revolution of the screw, which checks the drawing.

We will now derive a formula that will give us the gear ratio directly from the amount of the movement required for the support. In Fig. 4, 1 is the starting position; 2 is the position reached when the screw makes one revolution and is assumed to move with the support; 3 is the final position reached when the screw is returned to its original position.

Let

A = desired movement of support during one revolution of screw
Y = total movement of support when screw moves with it

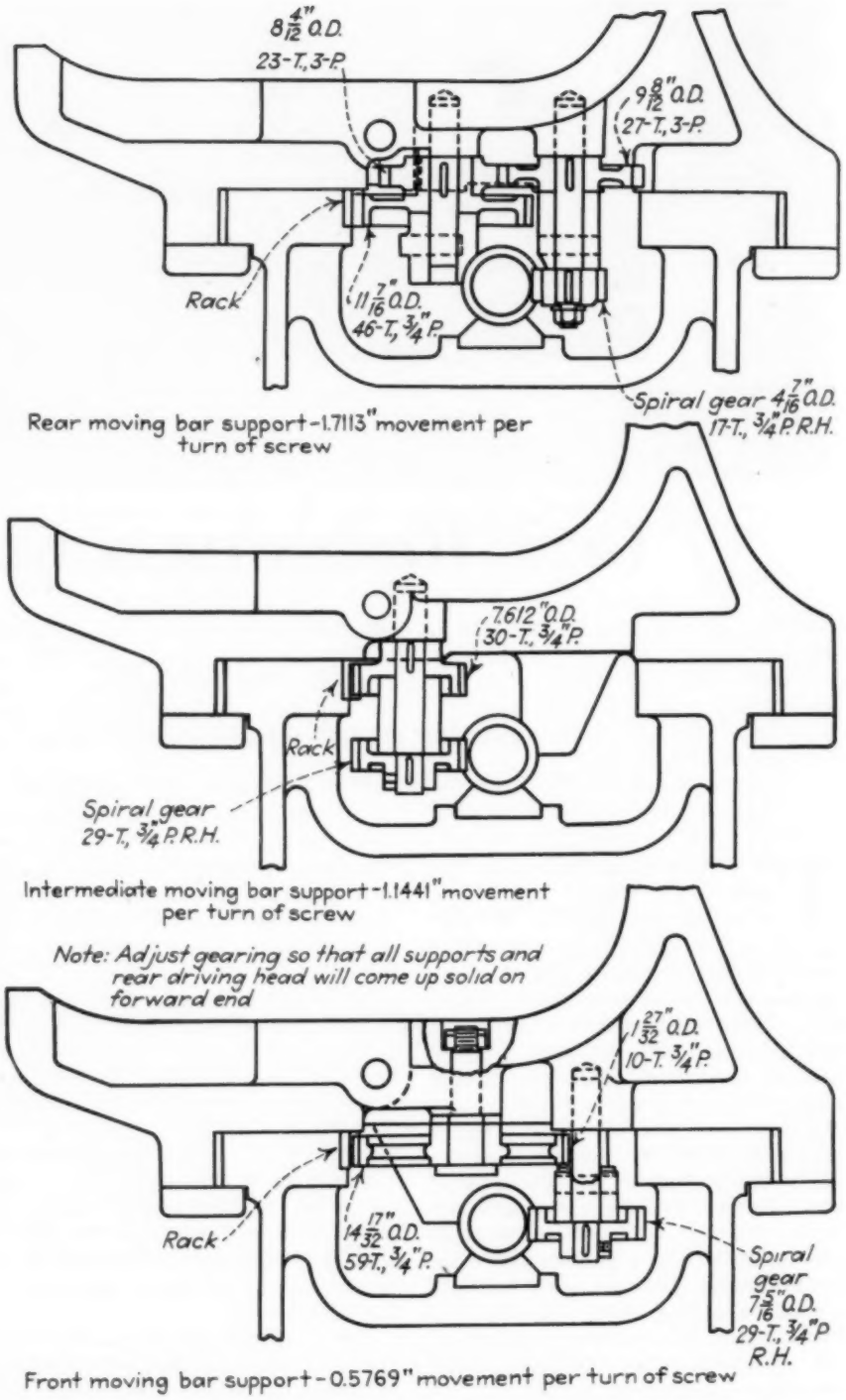

Fig. 2—Section views through the gearing on the three movable supports show how the various feeds are obtained

X = return movement of support when screw is returned to original position
H = number of teeth in helical gear
R = number of teeth in rack gear
N = number of threads on screw
C = circular pitch of rack

Then

$$\frac{NRC}{H} = Y \qquad (1)$$

$$A = \frac{H}{R} X \qquad (2)$$

and

$$X + A = Y \qquad (3)$$

Substituting the value of A from Equation 2 in Equation 3:

$$X + \frac{H}{R} X = Y \qquad (4)$$

Placing the values of Y in Equations 1 and 4 equal to each other:

$$X + \frac{H}{R} X = \frac{NRC}{H} \qquad (5)$$

Transposing Equation 3:

$$X = Y - A \qquad (6)$$

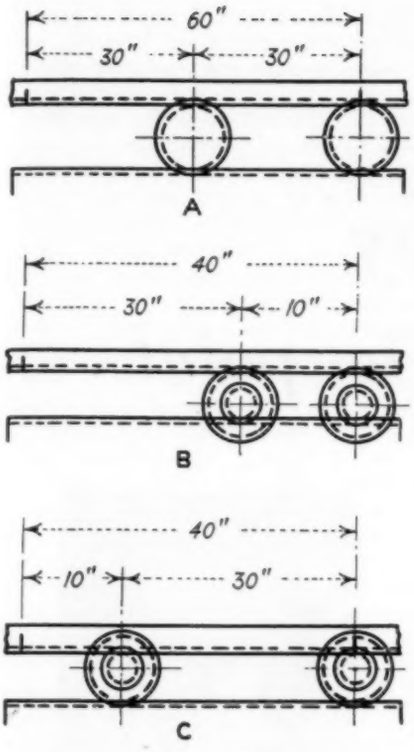

Fig. 3—Diagrammatic views give a clearer conception of what takes place when the screw is assumed to return to its original position

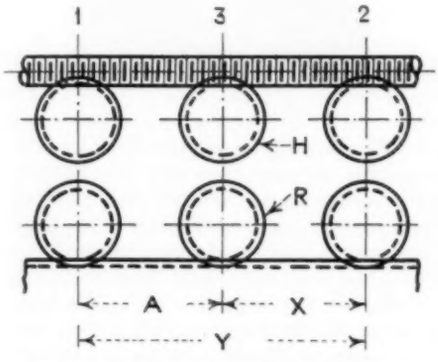

Fig. 4—A conventional sketch shows three positions of the support

Substituting the value of X from Equation 6 in Equation 5:

$$Y - A + \frac{H}{R}(Y - A) = \frac{NRC}{H} \quad (7)$$

Substituting the value of Y from Equation 1 in Equation 7:

$$\frac{NRC}{H} - A + \frac{H}{R}\left(\frac{NRC}{H} - A\right) = \frac{NRC}{H} \quad (8)$$

Simplifying:

$$\frac{H}{R} = \frac{NC - A}{A} \quad (9)$$

We will now apply this formula to the design of the supports on the gun lathe. As $N = 3$, and $C = 0.75$, Formula 9 becomes:

$$\frac{H}{R} = \frac{2.25 - A}{A} \quad (10)$$

As the lead of the screw is 2¼ in., the movement of the drive box will be 2¼ in. for one revolution of the screw. The required movement of the front moving support, intermediate support and rear support will therefore be ⅝ in., 1⅛ in. and 1⅞ in. per revolution of the screw respectively.

Applying Formula 10 to each support:

Front support $\frac{H}{R} = \frac{2.25 - 0.5625}{0.5625} = 3.$

Intermediate support $\frac{H}{R} = \frac{2.25 - 1.125}{1.125} = 1.$

Rear support $\frac{H}{R} = \frac{2.25 - 1.6875}{1.6875} = 0.333$

Because of the fixed distance between the screw and rack for all supports, the size of the gears and problems of assembly, the actual ratios vary somewhat from the ideal conditions.

The actual ratios are:

Front support $\frac{29}{10} = 2.9$

Intermediate support $\frac{29}{30} = 0.966$

Rear support $\frac{17 \times 23}{46 \times 27} = 0.315$

The difference between the actual ratios and the ideal ones is of little importance, as the supports and the drive box are assembled body to body at the forward end of the boring bench. The error will of course multiply for each revolution of the screw, but will only cause a small variation in the distances between the supports.

On the rear moving support an extra ratio was used between the helical and rack gears. With this extra ratio, Formula 10 would be changed to read,

$$\frac{H \text{ (no. of teeth in gear on rack gear shaft)}}{R \text{ (no. of teeth in gear on helical gear shaft)}} = \frac{2.25 - A}{A} \quad (11)$$

Any aditional gear ratios between the screw and rack should be added to the formula in a similar manner.

All formulas hold good only when the gear ratios and locations give a rolling motion of the helical gear along the screw opposed to the motion imparted to the helical gear by the rotation of the screw.

Bearing Metals and Pressures—Discussion

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Kemsing, Kent, England

Hardened steel bearings, as pointed out by John R. Godfrey, (*AM*—Vol. 77, p. 666) are still something of a problem. Small, high-speed spindle bearings have been successfully used in many cases. Research carried out during the war by Vickers at Erith, Kent, covered steel bearings on heavy guns. The experiments all indicated that the stationary journal should be harder than the moving part. This was the case regardless of whether the movement was rotary or sliding or the surfaces plain or roller bearings. The amount of hardness difference that gave best results varied with the load.

The steel used was high grade carbon, without alloy, the carbon running about 0.8 per cent or 80 points. The harder member, either bushing or roller race, was between 500 and 600 Brinell while the mating part was between 300 and 400 Brinell.

Rollers used in trunnions for the 7.5 in. howitzer were about 355 and the roller race about 550 Brinell. The load was very heavy and it was necessary to hold the hardness of each part within .10 Brinell numbers. Thus if the trunnions were 340 to 350 the roller race might be 565 to 575. Greater variation than this meant failure of the bearing. Roller bearing races stood up better with the outer race 20 to 30 Brinell numbers harder than the inner race.

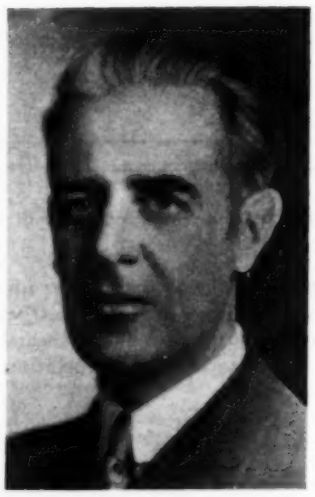
In one case of sliding parts we made the stationary part softer than the moving member. This was because the shape of the stationary part made it difficult to harden it satisfactorily. But the moving member was made harder in every part.

Another example is that of locomotive pedestal jaws (horncheeks) and the shoes (cheeks) that ride in them. With both the metals of mild steel of about the same hardness the parts had to be replaced in five months. By carburizing and hardening the surface of the shoes there was no serious wear at the end of twelve months' service. The hardness of the jaws was probably about 150 and that of the shoes approximately 400 Brinell.

It is my belief that many bearings fail because the elastic limit of the metals used is not high enough to stand a suddenly imposed overload as with a locomotive on a rough track. When hammering loads are to be encountered I always use a much harder metal than for normal loads. It is, however, more difficult to keep hard bearings cool for severe service.

Managed Money
From the Engineering Viewpoint

CYRIL BATH
President, The Steelweld Machinery Company



LORD KELVIN once said, "When you can measure what you are speaking about and express it in numbers, you know something about it. Otherwise your knowledge is of a meager and unsatisfactory kind." This is particularly true about money. So much has been written—so many theories advanced—so much confusion of thought exists that most men have given up as hopeless a subject wherein so little precise information appears to exist. They talk of ruinous inflations with bated breath, as the last resort of a world grown desperate of an unknown economic disease. Yet the cause of our troubles lies clearly recorded and the cure has been frequently demonstrated.

Long before the invention of money, the wealth of peoples was greatly enhanced by specialization, by the specialist exchanging products. The invention of machinery has but intensified that process. Only by the intervention of money is this exchange possible in modern society. If the exchange system breaks down, due to sudden shifts in the value of the medium itself, our entire mechanism breaks down with it.

We have no standards of value and only recently have standards for weight and measure been achieved. Not long ago our most enlightened ancestors were surveying with a rood determined as follows:

"To find the length of a rood in the right and lawful way and according to scientific usage you shall do as follows: Stand at the door of church on Sunday and bid sixteen men to stop, as they happen to pass. Make them put their left feet one behind the other and the length thus otained shall be a right and lawful rood to measure and survey land with. And the sixteenth part of it shall be a right and lawful foot."

Henry the First established the yard as the distance from the point of his nose to the end of his thumb and this was a considerable improvement, as Fisher points out over the generally accepted practice of earlier times when the measure of the girth of the chieftain was an official yard. "Imagine," Fisher continues, "the confusion in the cloth goods industry if orders were placed in Taft's administration and delivered in Wilson's." Fluctuations in gold, the standard by which we have attempted to measure values, are far more serious than fluctuations in all our other standards, for they affect everything we do.

Managed money means that instead of relating dollars to gold, which changes violently in value, the dollar shall be controlled by the average value of a number of commodities. If gold became scarce or plentiful it would be allowed to change in price just as other commodities now do, instead of pegging the price of gold and forcing all other commodities to perform handsprings to accommodate it. With such a system, there would no longer be any coinage of gold. The government's supply of gold would be kept in gold bars. Actual circulation would be the same as at present. The dollar would be controlled with a commodity index.

Now as this is the crux of the matter, may I illustrate by asking you to imagine a scale. On one side are held a number of commodities whose aggregate value equals and is balanced by a dollar having say thirty grains of gold. Under a managed currency, as we found the commodity side of the scale becoming worth more than the dollar side we would add a little weight—it will not in practice be more than one per cent—to the gold or dollar side to make the balance equal again. If on the other hand we found that the goods side of the scale was getting worth less than the dollar we would take out a little gold and so continue to keep the dollar and its value in goods always equal. Of course this would not be an actual mechanical movement of metal but would consist merely of an announcement by the Federal Reserve Board of the current gold worth for which dollars would be redeemable—just as it is now doing on the world's gold market and as in the past it has announced the changes in discount rates.

In practice, of course, a commodity index like that of the Labor Bureau would serve as a guide.

Objection is sometimes made that index numbers vary in relation to one another and that much danger would be incurred through manipulation. As a matter of fact if you will look at the index of thirty basic commodities imposed on the index of all commodities, there is little relative change except where prices have fluctuated with ex-

treme violence. Price indexes in England or Germany or in America show very little difference. Any old commodity index is a paradise of stability compared with gold. From 1873 to 1896 the value of gold in England almost doubled. From 1896 to 1914 it declined nearly one-third; from 1914 to 1920, its value declined nearly one-half; from 1920 to 1931 its value more than doubled.[1] On the other hand, *index* numbers for England in 1880 were 107 compared with United States indexes, calculated differently, at 100. Forty-eight years later in spite of the influences of war, tariffs and domestic policies the index numbers were 145 for England, 141 for the United States.[2]

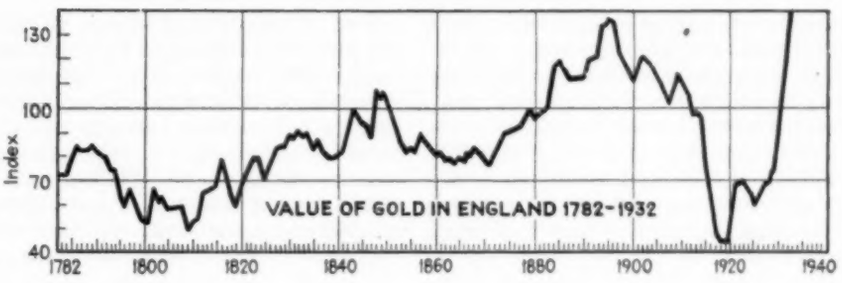
Managed money means the system of controlling values of currency in relation to commodities which has been in use, unobstrusively, by half the trading nations of the world for over two years with results much superior to those achieved by nations that have blindly adhered to any gold standard that prevailed when gold was worth half as much.

The dollar based on gold has no relation to values though this is its prime function. It is not a standard of value but a standard of weight. Its weight under the old standard was some twenty odd grains of gold; its value was whatever the market for gold happened to be.

One hundred years ago Sir Archibald Allison wrote, "The greatest events in the history of mankind have been directly brought about by a successive contraction and expansion of the circulating medium. The fall of the Roman Empire, so long ascribed in ignorance to slavery, heathenism and moral corruption was in reality brought about by the decline in production of the silver and gold mines of Spain and Greece."

Again, Professor Cunningham of Oxford says, "The scarcity of the precious metals in Rome, coupled with their fluctuating value, the complete uncertainty of prices caused a complete paralysis of trade. Money and circulating medium are not necessary to maintain life but they were necessary to maintain the civilized society like the Roman Empire."

On the other hand, Lyman Gage, Secretary of the Treasury under McKinley and Theodore Roosevelt, spoke for the majority of people then and now when he said, "As a general proposition, the quantity of gold is not a matter of great importance. Multiplying the prices of labor and all commodities by ten would not make anyone any richer, dividing prices would not make anyone any poorer, the power of labor to purchase



goods would be relatively unchanged." If this were true, the advocates of managed money would indeed have little to say.

Surely, it should not be difficult to appraise the result of the falling prices that accompany increases in the value of gold. Debts contracted at the high level become difficult of payment. When the decline goes as far as the present situation, they are indeed impossible for the large part. Within our own economic body we have large groups whose products are directly revalued in the new values of gold but who must pay debts and taxes in dollars containing just as much of the precious metal as formerly. The farmer who borrowed the worth of a bushel of wheat was faced with the insuperable task of paying back three. The bank that took a dollar deposit must find the value of two to meet depositors' demands.

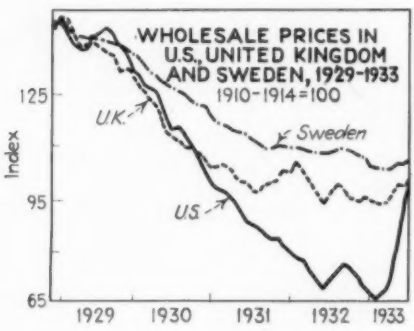
What has happened is just this. During the war, gold as a currency was abandoned by most of the world. It was used to pay for goods and services purchased from us and tended to pile up in this country. For that reason gold became plentiful and cheap in relation to goods. We had a boom—one of the worst inflations in our history, to tell the truth, when goods doubled in value in relation to gold. Many people feel that this price rise was due to war demand for goods. That this is a mistake may clearly be seen in that goods in countries working on a silver standard showed no such increase. Gold became cheap not only in relation to other goods but in relation to silver. That this sudden inflation was bad cannot be doubted as it tended to destroy the relation of values hitherto set and caused men to engage in many schemes based on a constantly rising value for commodities. Much as we fear inflation in this country, few were the protests heard while it was going on. We called it prosperity then and long for those happy days now. As the world's countries started on the gold standard, the demand for gold caused a rapid increase in its value and a consequent drop in the value of world priced commodities.

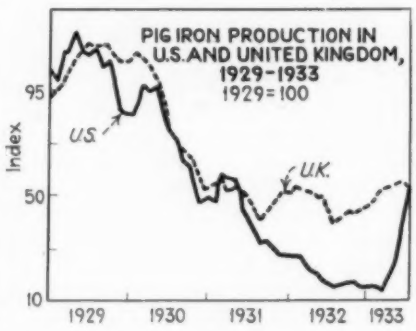
By world priced commodities we mean wheat and cotton and corn and tobacco, copper, scrap iron, silver—all goods selling on international or gold prices and, by the laws of substitution, all farmers' goods. Unfortunately for us, one-third of our population is engaged in the production of world priced goods. Our stock market is largely tied to gold. As gold in world markets became dear, commodities fell in price and our own commodities with them and our stock market on top of them. Now if railroad freight rates, (and this is really the heart of the situation), if taxes and debts, if the cost, for instance, of manufactured goods like steel and machinery had dropped in the same proportion as the price of commodities dropped, the prime producer would still be in position to buy with what he got, as Mr. Gage so blithely assumes, as much as he did before in spite of the increased value of gold. However, the fact is that manufactured goods were, as of March 1933, generally speaking, 60 per cent *above* 1914 prices. Debts, government costs, railroad and public utility rates, insurance premiums and doctors' bills were at 1929 levels while commodities were 40 per cent *below* the 1914 prices. It is quite apparent, therefore, that the one-third of our population paid in world prices on gold are simply not going to be able to buy with what they get the products that the rest of us make nor pay their debts or taxes, all of which are set in terms of dollars that have become twice as valuable as they were. The result of this has been the absolute paralysis of trade which, as Professor Cunningham points out, also occurred in Rome long ago. Now, we cannot raise prices of all the commodities of all the world by squeezing little pigs to pulp and draining them into the river at Chicago. We can reduce the gold content of the dollar and raise the price back to what was a reasonable trading level, as say in 1926. The fixed cost services and debts will stay fixed.

Mr. Kent, who managed our foreign exchange, said recently in a public article that to reduce the gold content of the dollar would be immoral—that the gold content was a sacred contract—that it made no difference what standard of value there was, if people bought more than they could pay for there

[1]Royal Statistical Society of London.
[2]"Prices" by G. F. Warren and F. A. Pearson.

wouldn't be enough money. But would they not have been able to pay if dollars, the medium of their contracts, had not doubled before these contracts could be fulfilled? Is this morality that we loan a man the value of one bushel of wheat and demand of him three in payment? Is this morality that we loan a workman the price of half his cottage and then within two years time take the whole thing and further demand that he work off a deficiency judgment? Can we picture the heartbreak and despair of millions of home owners and chatter about the amount of gold in dollars being *sacred?* It would seem that our measure of values has gone astray on more than commodity prices. The measure of our debts is practically the measure of our worth today. Surely it must be very clear that when the value of money changes it is no such simple matter as Mr. Gage would have us believe.





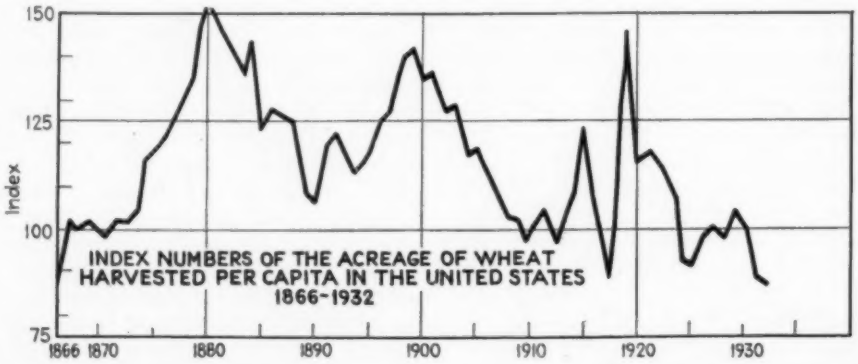
So much has been written and theorized about the cause of the present world debacle that we can easily lose sight of the fact that men who understood that the value of gold was the determining factor have steadily maintained the inevitability of the present occurrences—for ten years back. Indeed Warren and Pearson in their agricultural bulletins sounded a frequent warning from 1918 on. In 1928, in London, a group of men told me about gold and what it was going to do to civilization and more particularly, America. "It would be better for us that it were melted and poured hot down our throats."—"It would destroy civilization." One or two thought the progress of knowledge in managed currency would save the situation. They sounded very convincing. When I came back to the States in the midst of tremendous apparent prosperity, people told me, "You have been listening to those Englishmen. They are jealous. They used to know about gold and banking and things but this is a new era. You know it's where you calculate stocks on a new basis and everything."

In June of 1930, down in Mexico, a group of Jews told me again the same story. There was a corner in gold. Unintentional—through the ignorance of the new world bankers—but just as effective as if it were vicious. Stark ruin in commodities, paralysis of trade were in the years ahead. The American market was turning up. Hoover and the gold standard crowd were six-monthing around the corner. Shortly after this, the Interim Report of the Gold Delegation of the League of Nations said something of the same thing about gold early in 1931. In addition they pointed out, as had Warren and Pearson, that gold production had not kept pace with needs even disregarding maldistribution.

Better men could never convince a people owning half the world's gold that stark ruin would dodge their steps until the gold standard was abandoned. While Sweden, with managed currency and facing a world of disorder, has brought her business back, according to Halliday, to within reasonable distance of the 1928 levels; while England and the pound group were stopping the disastrous drop, we continued our headlong recession until with the closing of the sound money banks the boil finally burst of its own accord. Relieved of the sodden mass of overvalued gold, business bounded up in the wake of commodity prices. The nearer the old value of the dollar our newly freed exchange would go, the better business became, repeating the invariable experience of all other countries. When in mid-July we stopped the revaluation process, turned the dollar back toward gold values and started a campaign of socialistic measures—business fell off. Indeed, so serious has the interference of the NRA become that, in spite of a dollar revaluation that since has gone further than the mid-July figures, commodities and business indexes had not been able to hold an even keel until we started the gold market. The NRA and similar social experiments are as a compromise with a fundamental misunderstanding. We were all taught at the knees of our professors in economy that the price of an article depended on the supply or on the demand for that article. If it was scarce it would be dear; if plentiful, cheap.

But, what do we mean by price? For close to two hundred years we meant gold. But the supply and demand for gold is a variable, too, so that what we really have is one variable expressed in terms of another variable. Either one, changing, will affect the price of the article. If since 1929 we have seen the price of all our commodities drop 75 per cent the clear indication is that the price medium has gone out of step with previous values—certainly not that all values have changed. Not that the regiment is out of step with one man but that the man is out of step with the regiment. The NRA, the slaughter of little pigs, the plowing under of wheat and cotton all proceed from the old theory that supply and demand alone determine price. They assume that because prices are low there is too much of everything. So we engage in a process of destroying wealth to make ourselves richer, of working less so that we may have more, of loaning people more money who are already desperate with debts.

Overproduction? Man's progress has come from the increase in his productive ability. So far from having reached a stage where humanity has too much of everything, the work of the technician has been canceled out in the last twenty years by the breakdown of exchange. Mechanism has forced specialization, specialization means ever greater reliance on the ability freely to exchange products. The exchange of products has broken down because the medium of ex-



change varies so greatly. Up to 1914 and prior to the great recent advances in mechanical facilities, production of basic wealth, including all crops, forest products, mines, minerals and power, had increased in relation to the population at the annual rate of 1.73 per cent. Since that time it has increased only at a third of that rate.[1] Wheat is generally taken as a typical example of overproduction; yet in 1932 the harvest of wheat in the United States was the lowest in two generations. World shipments were 615 million bushels as compared with 753 millions of the ten-year average.[2] People have thought that because the price was low there was too much wheat. But ask the manufacturers of shoes, of cranes, of sealing wax and ships. Ask the producers of coal, ask the doctors and lawyers, and the engineers—there's too much of everything! Too many of everybody! Or is it that the breakdown of exchange has left the product or services of each specialist idle on his own hands?

Many people have felt that bad as gold might be it was better than to entrust the management of money to politicians. Gold, they felt, was good because its annual production was small in relation to the amount in use and consequently its value should be very steady. This viewpoint overlooks many things. That an internal policy of one country as, for instance, the United States, which in three years increased its gold holdings 70 per cent and its prices 74 per cent, may effectively corner gold, or that production may be less than the minimum required to keep up with wastage and industrial increase in gold-using countries. Or that the effect of countries leaving or adopting or returning to gold all will have a marked effect on the supply and demand for gold and, therefore, its value expressed in other things.

Difficulty of Manipulation

As to the human element—with an index to figure by, every stock exchange throughout the world would know the gold value of the dollar just as soon as the United States Treasury. The technique has been worked out very exactly by Professor Fisher and others. It would be a difficult thing for any ill-disposed treasury officials to manhandle. Powerful groups of nations have, in the last several years, tried to manage one commodity after another. We tried gold and cotton and wheat and, very lately, even little pigs. England tried rubber. It didn't work, it never has for long. If great nations couldn't manage the price of one commodity can we imagine any group of men foolish enough to try to manage all of them? Yet it would be necessary to manipulate all the commodities to cheat a commodity dollar.

Devaluation of the dollar, as far as this country is concerned, is a necessary preliminary to management. Justice demands a medium approximating values obtaining at the 1926 levels.

Revaluation and Inflation

Many people fear revaluation as a prelude to inflation. Inflation such as Germany experienced has not been met with except after revolution—the American, the French, the Russian and the German are cases in point. The way to get a thorough runaway inflation in this country will be to sit by till we get a revolution. The way to avoid the revolution and the inflation is to revalue. Quite popular and by no means extinct is the notion that the depression was a product of pessimism; that our difficulties are psychological; that all we have to do to get better business is to take a happier view of life. This is a jolly idea, but quite beside the point.

Revaluation and stabilization of the dollar will put to sleep most of the troubles that have plagued this generation. How will this help the manufacturer or the city people generally? How will this help domestic producers, the dollar value of whose services is not raised? This may be illustrated by the price of steel in London. It was six pounds before England went off gold. It was six pounds after. The *price* of steel had not risen but the *condition* of steel was very much better. What steel needed was orders—production. Six pounds was enough if they could get work. By the automatic revaluation of the pound that took place, the commodity producers were able to buy desperately needed steel articles and steel production started at once to increase. What steel needed was not a price rise but business. What our manufacturers generally suffer from is lack of business. What our commodity producers lack is price. Correct the price for the commodity producers and you will automatically correct the lack of business for the manufacturer. All that is actually done is to reverse or unwind the deflation through which we have passed due to the scarcity or high value of gold.

It must be admitted that the weight of conservative opinion in banking and commercial circles is scarcely enthusiastic about managed currency. But no one opposed steam more violently than the sailing ship captains. When Galileo announced that the earth moved conventional people proposed to boil him in oil.

Mr. Keynes, fellow of Kings College, Cambridge, said in 1924 in his preface to "Managed Currency": "Nowhere do conservative forces consider themselves more in place than in currency yet nowhere is the need of reform more urgent. One is often warned that a scientific treatment of currency questions is impossible, because the banking world is intellectually incapable of understanding its own problems. If this is true the order of society which they stand for will decay. But I do not believe it. What we have lacked is a clear analysis of the real facts. If the new ideas now developing in many quarters are sound I do not doubt that sooner or later they will prevail."

Managed money has arrived, as Fisher foresaw, a Cinderella clad in paper rags and roundly abused by the big sisters of finance and trade. But—make no mistake about it, the lady has her foot in the slipper.

Business End of a Small Shop—Discussion

W. R. NEEDHAM
Stafford, England

Fred H. Colvin's inaugural article in this important *American Machinist* series deals with a vital matter from the employer's standpoint. The present writer would like to consider the question of the small shop more from the standpoint of the employee, particularly the apprentice.

Where the non-university apprentice is concerned, in many of the great plants the tendency is for such lads to be given the poorer kind of specialist experience. They must generally confine their limited itinerary to one or two shops. The fact that in most progressive concerns opportunity for promotion is provided for lads who definitely make good does not seriously alter the actual condition in which most youths find themselves. On the other hand, in the small shop, with its small personnel, the almost necessary tendency is for the apprentice to be shifted about from job to job. There can be little question that this provides many of them with just the variety of experience they need in order to combine width of view and breadth of experience with thoroughness of training. They are much more likely to become versatile engineers, with a flair for adaptability, than those who receive a more detailed but less all-round experience in one of the largest plants. I consider that apprenticeship in a small shop, if followed by service in a large concern, has much to recommend it.

[1] "Prices" by G. F. Warren and F. A. Pearson.

[2] Canadian Bank of Commerce report, November, 1933.

Airplane Propellers Must Be Serviced Frequently

FRED B. JACOBS

REPAIRS on all parts of aircraft must be carried out with a high degree of painstaking skill, as an airplane can stay in the air only as long as it can fly or glide. Contrary to the general supposition, total engine failure is not a serious airplane mishap. If the engine dies when the plane is at an altitude of one mile, a skilled pilot by gliding can effect a landing several miles from the point of engine failure. Even at night, guided by airport beacons, which the skilled pilot knows as a mariner knows seacoast lights, a safe landing generally can be made.

However, if a propeller blade breaks in midair a bad accident can hardly be avoided. The instant the propeller breaks the centrifugal force of the out-of-balance propeller tends to tear the motor out of the plane and makes a safe landing very difficult. Extreme care must be exercised to see that propellers are in perfect condition at all times. Testing and repairing of airplane propellers is a trade in itself. This article illustrates and describes operations performed at the plant of the Aero Propeller Repair Co., Airport, Cleveland.

Inspection for Flaws

Modern aircraft propellers are made of a special aluminum alloy. The propellers are not castings, but are forged between dies and then carefully heat-treated. By modern X-ray examination flaws in a new propeller are detected readily and such a forging never is finished. Aircraft propellers are subjected to severe use as every impulse of the motor must be absorbed by the propeller as it works against air resistance. These impulses act as hammer blows and in time the metal becomes fatigued, in which condition it is liable to fracture. For this reason it is a general rule to inspect propellers after each 300 hr. of service. The operation in itself is simple and consists of etching the blades with caustic soda and neutralizing the action of this agent with nitric acid. Under this treatment flaws show up readily. If any are in evidence the propeller is discarded. If not, the blades are polished carefully and the propeller put in use again.

The polishing operation is illustrated in Fig. 1. The propeller is located by its hub on a special work stand while the polishing is done with a flexible-shaft grinder fitted with a rubber expanding wheel. These wheels range from 4 to 6 in. in diameter, 1- to 2-in. face. The rubber wheel carries an endless abrasive band, the bands varying from 36 to 320 grit while crocus abrasive bands are used to impart the final polish. The object of this fine abrasive is to bring about a high luster which reduces air resistance. The backs of the propeller blades are finished a dull black at this plant. This is to offset glare from sunlight and landing lights which might confuse the pilot. The high polish imparted to the blades does not last long as stones and cinders thrown up in the takeoff strike the blades, causing scratches and pits.

Etching, inspecting and polishing propellers is only a part of the repair work carried on at the plant in question. Fig. 2 shows two propeller blades injured by accident. The blade at the left is the result of an unexpected nose dive. Incidentally this accident reflects the high quality of the metal of which the propeller was made. Instead of snapping off as would a wooden blade, the metal is only bent out of shape. The blade at the right is damaged near the point as the result of a collision with a tractor. In repairing the bent blade the first step is to anneal it thoroughly. Then it is straightened under the 40-ton hydraulic press shown in Fig. 3. These blades are never hammered under any conditions as this treatment would tend to work-harden the metal. Considerable ingenuity must be exercised in straightening the blade and a number of setups under the press are necessary. It is essential to reset the angles so that they gage perfectly with predetermined standards. Then the blade is heat-treated and polished. The blade shown at the right in Fig. 2 needs only grinding with comparatively coarse grits to

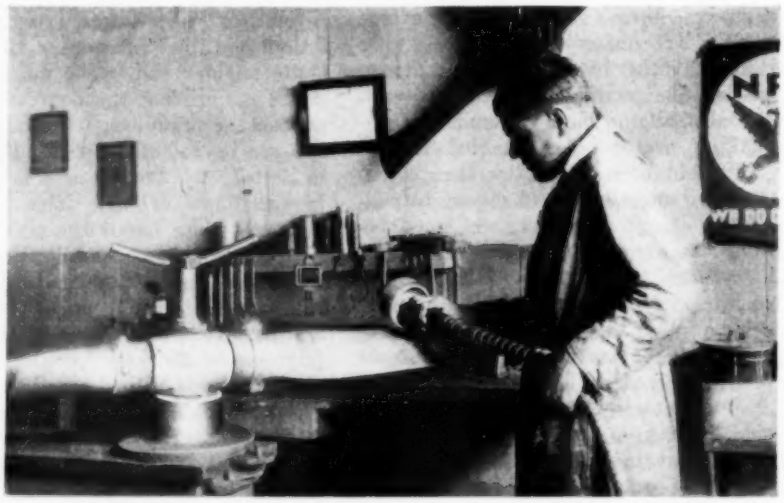


Fig. 1—After inspection or repair, the front faces of the propeller are highly polished to reduce air resistance

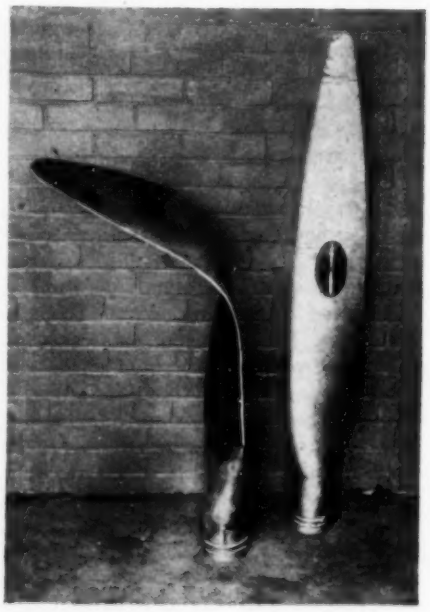


Fig. 2—Careful straightening and balancing will put these metal propellers back in service

smooth away the indented and cut portions followed by polishing and balancing operations.

An extremely important operation, that of balancing, is shown in Fig. 4. Each propeller must be in perfect running balance to function correctly. If out of balance harmful vibrations are set up in the motor. With a two-blade propeller, it is obvious that if metal is removed from one blade a like amount must be taken from the other blade to insure balance. Propellers can be balanced by adding lead weights to one side or the other in the center hole in the inner end of the blade. However, this practice does not always result in a perfect running balance no matter how carefully the operation is carried out. The generally accepted method is to grind metal from the blade ends.

The propeller in position on the balancing ways in Fig. 4 weighs 105 lb. and is designed for a 210-hp. motor. The balancing ways are made especially for this work. The framework is made of heavy-gage tubing while the base of the apparatus is firmly bolted to the cement floor. The ways themselves are provided with adjustments so that they can be set exactly level. Balancing propellers is a painstaking operation. It consists of cutting and trying until the propeller will not move radially when left in any position on the ways.

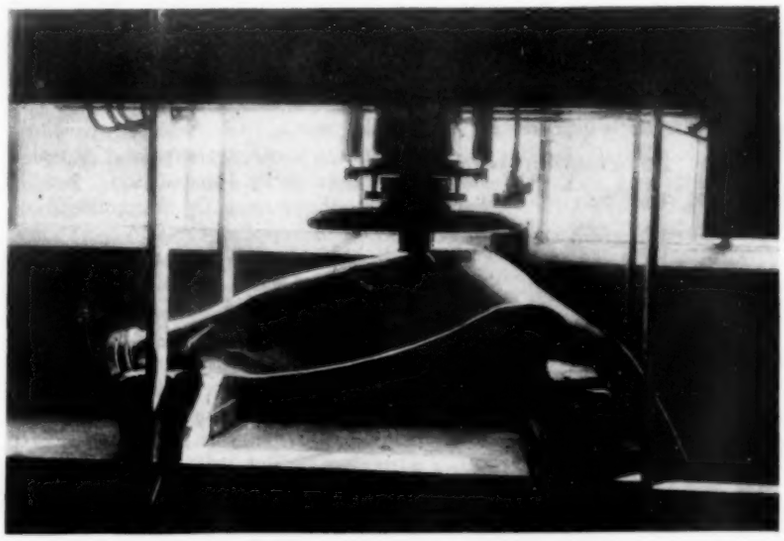


Fig. 3—Hammering is taboo for it would work-harden the metal. Numerous careful setups under a hydraulic press are resorted to until the angles gage perfectly

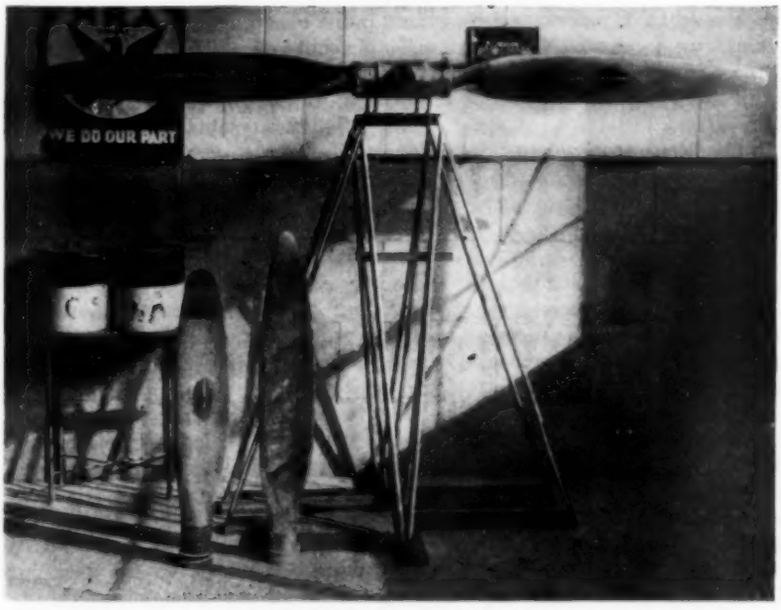


Fig. 4—Balancing ways are set exactly level, and the blade ends are trimmed painstakingly until the "prop" is in perfect balance

An Unsolved Explosion Discussion

HARRY SHAW
Consulting Engineer,
Heywood, Lancashire, England

The problem presented by William Anderson in an article under the title given above (*AM*—Vol. 77, page 596) is certainly intriguing. In view of various possible causes of sparks having been eliminated by Mr. Anderson's examination, one is inclined to think that they were caused by an electric current being generated by the turbine roto running at high speed in a magnetic field—perhaps the magnetic field from a nearby cable. When the current reached a certain potential it would discharge, causing a spark.

I am led to this belief by an experience I once had with a special machine designed for milling forged blanks. When the machine was operating, a series of crackling noises came from the high-speed gearing. Careful examination through a rotoscope revealed that the gears were not hitting anywhere, and the trouble was becoming a mystery, when a spark was noticed to be flashing between two gears. It was thought that current was leaking that drove the machine through a leather belt, but soon that source was eliminated by putting on a rubber belt. As the spark still existed, possible leakage through the reinforced concrete floor was eliminated by insulating the machine.

Unsuspected Magnetic Field

As the sparking still continued, it was decided that the electric charge was caused by the high-speed gears generating a current by rotating in a magnetic field. By gradual elimination, it was found that the magnetic field was from a high-voltage cable nearby, for when the current was not passing through the cable the sparking ceased. The gears rotating in the magnetic field built up an electric current which, when it reached a certain potential, caused a spark between two gears revolving in opposite directions. The spark took place where a projection on one gear caused a sudden reduction in the gap across which the current discharged. The machine was moved to another part of the works and the trouble ceased.

When re-turning commutators, the workman will sometimes get a nasty shock when he touches part of the lathe. The current, built up by the magnetic field from the residual magnetism in the commutator, being broken by the lathe bed, discharges through the body of the workman.

Perhaps Mr. Anderson may be able to nail his explosion to a similar cause.

Machine Tool Development in the U.S.S.R.

ALFRED M. WASBAUER

After a long vacation in the United States Mr. Wasbauer has returned to Moscow to resume his work with the Technical Institute for Research in Machine Tools (Enimc). He is therefore in a position to give current information on the plans of the Soviets for machine tool manufacture and their accomplishments so far.

COMRADE Ordjonikidze, the Commissar of heavy industry, in his speech before the 17th Congress of Soviets, which terminated recently under flags and banners, and in parades participated in by every worker in Moscow, stated plainly that the most important task of the Soviet Union in the Second Piatiletka is the development and maturity of an adequate machine tool industry. The machine tool industry is to be the preferred industry in this land in the second Piatiletka. Its workers will receive increases in wages and special benefits for meritorious work, because it is at this time the most important infant industry of Russia. As Comrade Ordjonikidze said (I am condensing his words): "We do not expect to be entirely free from foreign imports of machine tools by 1937, but we hope to be in a position to supply ourselves at a pinch, and thereby dictate our terms or obtain better terms of exchange. Some branches of our machine industry have developed at a fast rate, but our machine tool industry is lagging far behind."

The forging, hot and cold stamping sections of the machine tool industry are now the most backward as well as the most needed since they apply to the automotive, transportation and machine tool industries, and will receive the most preferment in the immediate future. Fifty-five million roubles will be allotted for equipment to plants manufacturing hot pressing and forging equipment. Two hundred graduate engineers will be assigned to the research and design of new and improved hot pressing and forging equipment. The 55 million roubles will presumably be spent for foreign equipment, but in the meantime, forging presses and machines will be built in the various existing plants for heavy machinery. This equipment is to be designed in the Central Designing Bureau, where special divisions are to be created for this work. Special research and design bureaus are to be created in all plants manufacturing heavy machinery. I presume the idea to be that somewhere, somehow, someone will find something to surpass America.

According to the present program, 6,750 tons of hot pressing and forging machinery will be produced in 1934; 18,500 tons in 1935; 33,900 in 1936; and 52,400 tons in 1937, or to put it mildly, and starting almost from scratch, a 700 per cent increase in 4 years. Not bad. To satisfy these requirements, five new large machine tool plants are to be erected in the second Piatiletka. A special institute has been organized to promote these new projects.

The Industrial Blackguard

As stated before, the blackguard of the machine industry in Russia is the hot press and forging industry. In point of scrap, the foundry industry comes a close second—I refer you to a later statement about foundry scrap contained in recriminations between related plants—but the machine tool industry is not far behind as a laggard, as stated by Comrade Ordjonikidze. This applies particularly to metal cutting machine tools and this onerous situation is to be liquidated as follows:

In 1934, 19,472 metal cutting machine tools are to be built in Russia;

In 1935, the production will rise to 28,000 metal cutting machine tools;

In 1936, to 39,350; and

In 1937, to 52,000 metal cutting machines.

This year is to be devoted to enlarging many existing plants and completing others under construction. For instance, the mammoth Stankolite foundry which supplies the Moscow region with castings is to be completed. This is the same plant accused of producing excessive scrap.

Of the many plants partially completed and under partial operation to be completed and fully operated this year is one in Kharkov building drilling machines. This plant has lately completed a modern radial drilling machine, and also a modern cylindrical grinder, both with push-button control, copied after European and American models.

There is a plant in Moscow called Samototchka, for the production of shapers and slotters, which is to be enlarged and completed this year. Then there is the experimental plant for speccial machinery "Stankoconstruction" connected with our Bureau "Enimc" which is to be operating this year. Many of these plants will buy machinery abroad.

At Gorky, formerly Nijni-Novgorod, there is an old machine tool plant called "Dviga tyel Revolutsii" which has been reorganized and is to be provided with new equipment. Its work has been very poor, its scrap being unbelievable. It is one of the black sheep to be brought into the fold of disciplined production.

In Moscow, there is the Ordjonikidze Plant, formerly called "Stanostroy," which has reached almost 100 per month production of the Warner & Swasey turret lathes, has started production of Fay automatic lathes, and is now planning additional models to the line on the provision of new equipment. Most of the plants which I have mentioned and which have been started in the last

two years are provided or equipped in large part with German machine tools.

A newly organized section of the Commissariat of Heavy Industry called "Glavstankoinstrument" has been ordered to plan and project the new plants required to fulfill the following program:

2 machine tool plants for grinding machines;

1 plant for gear cutting machines;

1 plant for screw machines and other automatic lathes.

It is planned that within one of these new plants will be a shop devoted to precision machinery. All of these new projects must be in operation by 1935, according to the orders of Comrade Ordjonikidze. In the same breath, all organizations concerned with machinery production of whatever kind are instructed to begin producing special machine tools, with the technical assistance of the trust mentioned above. This may sound somewhat vague, but in fact, if by study and devotion you can make yourself super-competent in some line (which is not difficult) you can claim and obtain a practical monopoly on that line, without "unearned" profits, of course.

Now if readers do not too easily tire of Russian names and figures, I should like to give a little information on the accomplishments of the machine tool industry last year. One of my sources of information is "Enimc," which officially goes by the high-sounding title of "Technical and Scientific Institute for Research in Machine Tools," with whom I drink tea.

The Warner & Swasey turret lathe, and Fay automatic lathe plant in Moscow, "Ordjonikidze," report that they estimate their production last year at five million roubles gold.

The training school plant "Konsomoletz" located at "Yegoryevsk" in 1933 built 417 machine tools, including gear hobbing machines of the German type "Pfauter."

In Ammunition Plants

In Lugansk, where the mammoth locomotive plant is being whipped into shape, there is an ammunition plant which has fulfilled its assignment for the production of a certain number of machine tools. But no figures are available about war plants.

The same may be said about the war or ammunition plant at Perm—that they have fulfilled their quota of machine tool building.

The tooling plant "Zlatoyet," located in the Urals, reports that it produced 27.5 million roubles worth of small tools in 1933. This plant has now begun to produce grinders of the German type "Fortuna," and has received special commendation for its work. I may as well mention at once that plants never report that they have produced a certain value in gold roubles, but that they have saved the country a certain sum in gold roubles that would otherwise have been imported. The aim of every "udarnik" is to save the country from spending gold roubles abroad.

The tool shop of the airplane plant "Stalin" has started the production of cutters for Gleason bevel gear generators.

The plant "TZ-K Machinostroyenyia" at Samara on the Volga, or in the Volga district, is organized to build lathes and circular cold cutting saws. In the past year, it produced 300 units. It has also begun the production of thread millers and special lathes.

The Scrap Alibi

The milling machine plant at Gorky (Nijni-Novgorod) should have produced 270 knee-type milling machines in the first nine months of 1933, but produced only 223. It had a large alibi to offer and did it in this form: the other old plant in Gorky which I mentioned before was to supply it with parts, which was done at the rate of 96 per cent scrap, so it is said. Then the new regional foundry in Moscow, Stankolite, which I also mentioned before, supplied it with 80 per cent scrap. There doesn't seem to be that much scrap in the world, unless it is dictators, but the forgings and parts coming from the Samara plant (also mentioned before) registered 95 per cent scrap. In eight months, the operators of the Gorky plant estimate that they received 426,000 roubles worth of scrap. Still they rejoice to know that the machines they have so far produced compare favorably with the Cincinnati product in workmanship. Besides, they are said to have reduced their manufacturing cost from 45,000 roubles per unit to 15,000 roubles per unit in that period. That's something.

The plant "Ilitch" at Leningrad has produced its first Cincinnati universal tool grinder which proved very satisfactory, being fully equal to the American product. This plant is slated to produce 1,200 "Cincinnati" grinders in 1934—the peace of Allah be upon it considering that this is only the beginning of its trouble, for in the same year it is also to produce two models of tool grinders from the German firm "Stock" and one model (pedigree unknown) of automatic circular saw grinder. This besides the regular business of making abrasive wheels.

The plant "Stankopatron" at Moorom is devoted to the making of jigs, chucks and fixtures, and has filled its quota.

The plant "Proletariat" at Gomel has begun to produce shaft turning lathes.

The war and ammunition plant "Frounze" at Penza is preparing to produce the German automatic lathe "Index," of the firm Hahn & Kolb, Stuttgart, and is to produce 45 units in this year, and 500 units up to 1938, just as a little side job to the regular work.

The plant "Frazer" in Moscow in 1933 produced 8 million small tools of all kinds, representing a value of 15 million roubles. In 1934, the output must reach the figure of 26 million roubles, besides 200 tool grinders and backing off lathes. That is not such a small job either, when you are not used to it.

The plant "Ijevsk" in the town of that name has produced 1,180 "American" type belt-drive lathes in the last year. It is starting the year on a new modern electrified button-controlled model, which will be in production this year.

The plant "Sverdlov" in Leningrad has produced an automatic machine for threading pipe couplings for the petroleum industry.

A plant "Machnikov" in Samara is slated to make bench drillers of 10 mm. capacity and must produce 1,000 such next year.

Weeding Out Obsolete Tools—Discussion

FRANCIS W. SHAW
Heywood, England

Godfrey, (*AM*—Vol. 77, page 587) is right. Few tool cribs there are that would not be more efficient after a good cleaning by a real shop man. And it would not be solely the older tools that would go, but some that had never seen an hour of service.

I would scrap, for instance, the remainder of that stock of cheap center drills, which though quite nice looking, cost more in time and material wastage than the whole stock was worth. They will never be used, for sad memories still linger of drilling out their "stings" after a process of "cauterizing," the successful completion of 700 pairs of center holes with a single *good* center drill after breaking a score of the others.

The market is flooded with low-quality tools of every description, many of them with appellations designed to suggest perfection, but few with the makers' names. So unsatisfactory has my experience been with such tools that I would not daré to recommend any of them nor to risk again paying more in wages and for scrapped material than the tools cost.

Skilled Men Are Scarce

WARNINGS voiced weeks and even months ago are being justified. The shortage of skilled men in the metal trades is serious, and employers are struggling to adjust their production plans accordingly. It will inevitably become more serious as production picks up beyond the 25 to 50 per cent capacity figure of the present time.

Bad enough in most branches of the metal-working industry, the situation is acute in the shops where machine tools and other production machinery are built. Few of these shops have ever found a way to avoid the wide fluctuations in business that have made their lot one of feast or famine. As a consequence, they have found it impossible to keep on all of their skilled men during dull times no matter how good their intentions. Is it any wonder, then, that some of these men who have found steadier jobs elsewhere refuse to return to their old companies when they are needed?

General impressions are of no consequence in arguments on the extent of the skilled labor shortage. Therefore specific instances have been collected from a number of industrial centers.

Some Definite Shortages

Here is what employers of skilled men say:

"At the present time the only shortage that worries us is in skilled gear tooth grinders." This from an automotive parts plant.

The manager of a special machinery plant in New England says: "There is a definite shortage of Bullard and Lucas boring mill operators in our locality. On the other hand, there is an oversupply of semi-skilled mechanics who could operate drill presses on production work, etc. This does not help a shop like our own, however. The restriction of hours for highly skilled employees is exactly contrary to what the administration desires; namely, either increased employment or purchasing power. We can help out by increasing the amount of money in the employee's pay envelope if they will only let us."

A Cincinnati machine tool builder finds a scarcity in the following groups of experienced men: Hand screw machine and automatic screw machine, including set up; internal and external grinding hands; turret lathe hands.

Another machine tool builder, in Cleveland, says that that city is experiencing an acute shortage of planer, boring mill and turret lathe hands, high class fitters, and toolmakers. Of his own shop he says: "We have had great difficulty getting planer hands, boring mill hands, and turret lathe hands, good and experienced. Today if we had to employ three horizontal boring machine hands we would not know where to go for them in this city. Turret lathe hands could be had but they are an indifferent sort, inexperienced, and turn out very unsatisfactory work."

Only 40 Per Cent Available

A New England machine tool builder says: "I want to tell you that we have re-engaged all of the skilled labor formerly employed by us that is available. Old employees now employed represent only about 40 per cent of our former force. The others have scattered hither and yon. We brought one of our old grinder hands back from as far away as Charlotte, North Carolina.

"As illustrative of the conditions here may I say that I found one of our most expert milling machine operators serving as a drug clerk in a nearby town, who refused to give up his position to come back to work. A first class planer hand is operating a gas station, and he would not return, and another running a milk route also refused."

One of Detroit's oldest motor car plants has had difficulty securing "sheet metal finishers and polishers, and metal band sawyers as well as power hammer men on sheet metal. The last mentioned are almost impossible to get. While our group on welders, arc and acetylene, is complete, it was with extreme difficulty that we filled our requirements. Bullard operators and semi-automatic men have also been hard to find. In the automatic screw machine division, experienced men are obtainable only occasionally."

Plenty of Unskilled

From northern New York comes this statement: "Having difficulty in securing hand screw machine operators who can set up their own work on bar machines. There is a shortage of turret lathe operators on bar work, and of milling machine hands who can set up work, although there are plenty of men having a little experience on milling machines but unable to do the work of skilled hands. Radial drill hands are scarce, and but few operators of Gleason gear cutting machines available."

Another New England machine tool builder says: "We are faced with a serious situation because of the shortage of men capable of operating horizontal boring mills, jig borers, automatic thread lathes, vertical turret lathes, Pratt & Whitney shapers, milling machines, radial drills and precision grinders.

"Further, many of our operations require men capable and experienced in the use of fine measuring instruments. We find that, particularly with the new men and to some extent with the older and experienced men, the 'feel,' so necessary for the use of verniers, etc., must be re-acquired before our plant gets back to its accustomed stride. In general, even our older men are not more than 75 per cent efficient, as compared with their work in 1928 and 1929."

A Philadelphia plant executive writes: "We have had great difficulty in obtaining skilled operators for horizontal boring machines, planer-type millers, large planers and large turret lathes. The first difficulty arose from the reluctance of our old men, who had obtained permanent jobs in other lines, to leave these jobs unless we could guarantee practically continuous employment. Since we could not do this they stuck where they were.

"In answer to a recent advertisement for machinists we received 276 answers, interviewed 42 and hired 6."

What Can Be Done

These are the facts. What's to be done?

For the immediate present the best interests of the men, the employers and the community will be served by finding a way to permit the skilled men, of whom there is a scarcity, to work longer hours, in order that their particular machines and operations shall not constitute bottlenecks in the production line, thereby restricting output as a whole and forcing out of work the less skilled operators. This is a job for the Code Authorities concerned, and they should have the hearty support of NRA officials in finding this way.

What of the future? If the present is bad, the future will be worse, as production schedules are stepped up. Most of our apprentice schools have been empty during the depression. They must be filled at once. Probably we shall have to resume something similar to the "vestibule schools" of war days in order to train men quickly. The technical high schools and trade schools will be called upon for trained youngsters, and they must have support both from industry and from the Government. If every means for the rapid training of machinists is not used we shall certainly run into a jam that will block the path of prosperity. Steps must be taken at once to get men into training.

EDITORIALS

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EDITORS

Reason Rules

DESCRIBED by General Johnson as the greatest gathering of industrial leaders ever assembled in this or any other country, the Conference of the Code Authorities is now history. The outstanding accomplishment of the meeting was expressed by the NRA Administrator in his final speech when he announced that Code Authorities would be *urged* to find ways to reduce hours and maintain wages in order to absorb more of the unemployed. Many of them had expected a flat order to this effect.

Whether the vigorous and logical protests against the issuance of such an order turned the tide, which was surely setting in that direction a week earlier, it is hard to say, but certainly no one who heard them could help but be convinced of the sincerity of the speakers and the soundness of their arguments. Many of them dwelt on the effect of "bottlenecks" occasioned by the shortage of skilled men, as shown so clearly for the machinery industry in the article on the opposite page. Others pointed out the danger of complete strangulation of capital goods industries whose working capital has already been dissipated by nearly forty per cent. NRA listened.

One thing is very clear—compliance is now the key to the situation. If the code authorities do not make immediate progress toward it their industry members may expect something very drastic, and probably destructive, from Congress. If the NRA compliance machinery does not function promptly the whole NRA structure will fall. And that would be a catastrophe, if the statements of most of the speakers at the Conference are to be taken at face value.

Another example of the rule of reason that characterized the meeting was the final separation of the capital goods and consumer goods industries. At the close of the meeting each of these two groups formed committees of twelve to confer with General Johnson on the lessons of the Conference and on the next steps to be taken. For many months observers have been remarking on the wide difference in the problems facing these two major industry divisions. The appointment of the two committees is evidence that these remarks have been heard.

During the next few weeks we may expect to hear some bitter complaints from those who still fail to take NRA seriously. They are the ones who have continued to "chisel," who have openly flouted Clause 7 (a), or who have refused to sign the codes of their respective industries. But they should be recognized as the recalcitrant minority. The great majority of industry agree with the President that "we are not going back either to the old conditions or to the old methods."

Lost—Skill and Ambition

ONE of the results of long layoffs is becoming apparent as men are being put back to work. From different sections of the country come reports of loss of skill in men who were top-notchers two or three years ago. In addition there is a change in the mental attitude toward the job. The shattering of the old belief that a skilled man could always get a job has developed a spirit of indifference and a lack of ambition that did not exist before.

Direct results of both of these factors are already apparent in lowered production, both as to quantity and quality. This attitude is a menace to the economical production that has meant much to our success in manufacturing. It is a direct challenge to management to restore the morale, both by present consideration and by long time planning that will insure greater stability to those on whom industry depends so largely for its existence.

Silicosis—and Rackets

DUST hazards have been largely eliminated in machine shop practice. Exhaust systems and flooded grinding operations have reduced the annoyance and the danger to a low point, but it cannot be dismissed on this account. For while there is but little hazard, it has been proved that silica dust is a real danger, which may not become evident for years after its absorption, and which finally induces tuberculosis or pneumonia. This lack of direct manifestation affords excellent opportunities for unscrupulous lawyers to do a lot of racketeering, and damage suits of large proportion are pending in many sections.

Industry has no desire to shirk its legitimate responsibilities, but it must protect itself against unjust claims. To do so it should secure and maintain evidence as to the physical condition of its employees at the time of hiring and at such intervals as experience may prove advisable. And, of course, it should insure itself against damage instead of waiting for civil suits.

While the danger from silicosis, the name given

to lung infection caused by silica dust in various forms, is slight in most machine work, this does not necessarily protect the manufacturer if an employee develops disease from this cause. For, while the silicosis infection may have occurred years before, this will be difficult to prove unless there is a record of its existence when the worker entered his employ.

This is a subject to be carefully considered, not with a view of escaping legitimate responsibility but in order to be protected against racketeering lawyers. Where confidence exists between employer and worker no trouble will be experienced in working out plans that are fair to both. Indisputable medical records made by impartial physicians seem to be a necessary part of any method that may be adopted.

.CHIPS.

Washington—President asks Congress to create commission to coordinate and control all communication facilities . . . John W. Davis attacks the New Deal saying regimentation is impossible and undesirable . . . National Board of Review, headed by Clarence Darrow, is created by Roosvelt to look after the interests of the little fellow under the codes . . . NRA Code Conferences discuss shortcomings of codes, hear Johnson present 12 points where improvement is needed, hear the President imply that NRA is permanent, and adjourn after being urged—not ordered—to reduce hours and maintain wages . . . Roosvelt asks Congress for authority to negotiate reciprocal trade treaties lasting three years and to raise or lower rates 50 per cent at his discretion . . . Announces substitute for CWA to care for three groups: Rural, urban and "stranded populations" in single-industry centers . . . Asks reopening of Philippine independence case for modification . . . Senator Wagner offers measure to outlaw company union . . . Roosevelt makes findings of Labor Board final, adds five members including two vice-chairmen . . . House votes to investigate all phases of Army buying . . . Consumers' Board demands revision of price and machinery restriction clauses in codes . . . Col. Waite reports PWA employment peak in April.

Foreign—British manufacturers up in arms against Japanese commercial invasion, engineer boycott against cheap bicycles . . . Pu-Yi ascends Manchuko throne in impressive ceremony . . . Three Reichstag fire communists released to Russia by Nazis . . . Pope makes Cardinal Faulhaber a papel envoy to protect him . . . French cabinet plans increase in military strength . . . British railroad traffic and department store sales indicate decisive recovery in business . . . Conservative Germans apprehensive concerning Nazis socialization . . . Commons approves British-Russian trade treaty . . . Austria dissolves all trade unions . . . Poland and Great Britian study problem of Manchukuan recognition as a practical matter . . . Roosevelt's non-aggression proposal pleases Soviets . . . General strike in Cuba . . . . Germany and Poland sign tariff agreement.

Finance—Federal Trade Commission makes public the salaries and bonuses received by heads of 900 corporations . . . British pound stabilization fund resumes operations . . . Panama demands debt payment in gold . . . New high record for bank reserves is set—$1,350,000,000 . . . Governors of Federal Reserve Banks vote approval of a system of intermediate credit banks . . . Promised modification of Securities Bill encourages Wall Street . . . Morgenthau would tax state and municipal securities.

Industry—American Car & Foundry negotiates with Studebaker for control of White Motor . . . I. C. C. authorizes C. & O. to borrow nearly $17,000,000 for replacement of freight and passenger cars up to 61 years old . . . B. & O. and C. M. St. P. & P. study possibilities of streamlined steamtrains of Kuhler-American Locomotive Co. design . . . Knudsen predicts that 1934 wages of automobile production employees will equal 1929 figure . . . Weirton Steel case comes back to Attorney General Cummings . . . 5,000 out at three Aluminum Co. plants, ordered back by Labor Board . . . Ford reduces prices on passenger cars $25 . . . Financial troubles cost Citroen control of his automobile plant . . . House Labor Committee votes approval of 30-hour bill . . . Threatened strike of 30,000 automobile plant workers postponed as Wagner promises hearing . . . NRA license provisions to be extended.

Trade—George N. Peek accepts presidency of Export-Import Bank organized to extend credits on Russian trade, and of two similar banks, one for Cuban trade financing the other for trade with other countries . . . Arrangements under way to sell $20,000,000 silver to Cuba . . . U. S. foreign trade balance drops as imports rise and exports fall . . . Food index reaches peak but commodity index recedes slightly . . . Chain store sales continued to advance in February.

Indicators—Electric power production rises again, being well above the 5-year average . . . Steel production approaches 50 per cent of capacity with future bright . . . Carloadings up slightly but still below 5-year average . . . *Business Week* index slips fractionally to 64.2.

General Johnson Disclaims "Set Rule" for Shorter Week

WASHINGTON—Winding up the greatest assembly of industrial leaders ever gathered, Hugh S. Johnson, National Recovery Administrator, closed the three-day conference of code authorities with an address in which he emphasized that the goal of shorter hours and higher wages would be achieved with due regard to the partnership spirit and without the imposition of arbitrary fiat. Following up the President's advocacy of a shorter work week, General Johnson definitely advanced a plan for a ten per cent cut in hours and a corresponding advance in wages. However, he acknowledged that exceptions were necessary for some industries and that the rule would be applied with resiliency.

General Johnson referred back to his "twelve points of complaint" and said it was up to industry to solve them. He asked that two committees of twelve be appointed, one for capital goods under the chairmanship of George H. Houston, of the Baldwin Locomotive Works, and one for consumer goods under the chairmanship of George Sloan.

Although final results will depend on conferences between these two committees and General Johnson, the conclusions appear to be as follows:

1. The basic working week, set in most existing codes as 40 hours, with exceptions down to 36 and up to 44, will generally become 36, with 40-hour weeks the exception.

2. Open price policies will be under strict regulation and will be allowed for industries that can show the need of them and the absolute justice, to labor, manufacturer and consumer, of their existence.

3. Wages will go up, in the minimum classes, both in keeping with reduced hours, so as to keep pay envelopes about the same—say 10 per cent.

4. Exemptions from these three provisions will be granted upon the showing of proper cause. Otherwise they will be put into effect by means of executive changes, as authorized under NIRA.

5. Code compliance is to be handled more aggressively, with the fullest cooperation of industry, and with the greatest possible responsibility and power resting in the code authorities and their agents. The Blue Eagle will be revived, with the name of the code and the serial number of the industry used on products as a symbol of cooperation.

6. The magnificent showing of cooperation which industry made by sending its 4,000 leaders to Washington will be used to the fullest by the administration to demonstrate to Congress the feasibility of voluntary solution of the unemployment problem and to stave off drastic mandatory action on the 30-hour week and similar measures.

Ralph E. Flanders, president of Jones, & Lamson and member of the Industrial Advisory Board, was given an ovation in the afternoon session in the big hall following the President's opening address of the morning; he spoke against the reduction of hours on the ground that they were a deterrent, rather than an aid, to recovery, saying that "as a temporary measure during the depression, shorter hours have something to be said for them; as a measure of recovery, they are not advantageous, but destructive."

Herman Lind, of the Machine Tool Builders Association, in the first evening session of the conference received round after round of applause as he defended the open price policy against the keen questioning of Division Administrator A. D. Whiteside. Throughout the session, speaker after speaker brought up the point of the lack of skilled labor—a condition due, as J. H. Hoadley, of the gray iron industry code authority, put it to the fact that during the depression it has been impossible to employ apprentices as the jobs were needed by the old employees. This condition was tacitly recognized by officials of NRA, even in the labor group, and the reports of increasing business which were exchanged by word of mouth by hundreds of the delegates made yet firmer the opposition to shortening of hours for skilled workers, not so much on the ground of the increased cost (as was the case during the summer months of code discussions) but on the basis of fear that there would not be enough skilled men to turn out the orders. Everyone recognized, however, the tremendous problem of the millions of unskilled who are unemployed.

George S. Brady, former managing editor of *American Machinist*, deputy administrator in charge of many machinery codes, presented a proposed amendment to all codes on shortened hours which apparently bore the stamp of NRA approval. Col. Brady's proposal is for a limit of eight hours a day, and 36 hours during any six days of a week,

Exports of Machinery During January, 1934

	Jan. 1934	Dec. 1933	Jan. 1933
Electrical machinery & apparatus	$4,531,567	$5,492,096	$3,085,903
Power generating machinery (except automotive and electric)	422,161	480,064	220,538
Construction machinery	322,713	295,208	203,490
Power-driven, metal-working machinery	1,188,715	879,333	576,134
Mining, well and pumping machinery	1,301,506	1,466,273	990,571
Other metal-working machinery	125,802	119,588	93,734
Textile machinery	637,524	585,398	332,049

Exports of Metal-Working Machinery During January, 1934

	Jan. 1934	Dec. 1933	Jan. 1933
Engine lathes	$84,754	$30,183	$17,333
Turret lathes	17,105	4,849	12,187
Other lathes	19,091	21,334	13,057
Vertical boring mills and chucking machines	23,638	6,625	7,800
Thread-cutting and automatic screw machines	56,760	86,540	1,546
Knee and column type milling machines	19,095	26,112	32,140
Other milling machines	76,981	64,748	23,840
Gear-cutting machines	55,134	50,288	44,826
Vertical drilling machines	25,426	9,837	4,199
Radial drilling machines	4,374	4,440	29,035
Other drilling machines	30,879	37,926	27,312
Planers and shapers	15,707	7,996	1,068
Surface grinding machines	32,946	53,402	6,569
External grinding machines	98,849	35,741	18,394
Internal grinding machines	81,807	47,386	2,515
Tool grinding, cutter grinding and universal grinding machines	57,618	25,156	29,814
Other metal-grinding machines	86,258	14,521	20,710
Sheet and plate metal-working machines	106,617	143,346	48,424
Forging machinery	66,385	24,309	9,277
Rolling mill machinery	56,281	17,417	9,734
Foundry and molding equipment	17,308	19,344	52,044
Other power-driven metal-working machinery and parts	155,702	147,833	164,310

Other Metal-Working Machinery

Pneumatic portable tools	$26,757	$32,253	$10,953
Other portable and hand or foot operated metal-working machines and parts	46,765	37,768	19,299
Chucks for machine tools	3,724	11,530	2,892
Machine operated pipe and thread cutters, stocks, dies, taps & other machine-operated tools	31,647	21,432	41,670
Other metal-working machine tools	16,909	16,605	18,920

but not applying to highly skilled mechanics, draftsmen, designers or toolmakers making over $35 a week, and allowing these to work up to 60 hours on 1½ overtime above the 36 hours, with the usual additional exceptions for office employees of the "executive" class, watchmen, shipping employees (who would have a 10 per cent tolerance) and emergency crews who also would get overtime.

One of the ablest opponents of the 30-hour week as a solution of the labor problem was Dr. A. J. Hettinger, Jr., Detroit economist, who has been ranking scientific member of the Division of Research and Planning of NRA since early summer. He declared that the 30-hour bill now before Congress would, if enacted, "freeze the depression at present levels, demoralize the cost structure, create innumerable inter-industry difficulties and lessen the volume of physical production and real income." General Johnson, who was presiding, remarked, following a tumultuous outburst of applause, that "clapping hands won't solve this problem." Dr. Hettinger had told General Johnson just before that the dominant problem was "to put back to work the dollars and men where the bulk of unemployment exists, in the heavy industries," adding that only 10 per cent of present unemployment was in the consumer industries.

The "small industries" section of the conference took up both the problems of the smaller industries whose codes are now becoming more numerous than the industries employing hundreds of thousands, and also the problems of small industrial units, chiefly with regard to finance. An immense amount of important data was filed, and this will be carefully gone over by the newly created Review Advisory Board under the chairmanship of Clarence Darrow. Many had been unable to get needed credit.

Major Crom Made Machine Tool Code Representative

Succeeding Neal W. Foster, Major W. H. Crom has been appointed administration member on the supervising agency of the machine tool and forging machinery industry. He will also act in a similar capacity for the special tool, die and machine shop industry.

General Hugh S. Johnson also announced recently that Lieut.-Col. Samuel F. Fleming has been appointed as administration member for the agency of the steel tubular and firebox boiler industry, to succeed Neal W. Foster. This is in accordance with the policy of the relieving NRA officials from participation in the administration of codes.

Other governmental appointees on code authorities in the metal-working industry are as follows: Shepard Barnes, formerly secretary of the Ellis Adding Typewriter Co., to succeed Walter A. Janssen for the cap and closure industry; Mr. Barnes was also appointed to the governing bodies of the crown manufacturing industry and the electric storage and wet primary battery industry; Howard B. Hall, formerly partner in the engineering firm of Murray and Flood, to the fire extinguishing appliance manufacturing and motor fire apparatus manufacturing industry; Arthur D. Smith, head of the Smith Woodworking Co., to industrial supplies and distributors trade; Ralph C. Davis, professor of industrial and personnel management, Ohio State University, to the roller steel door industry; James L. Palmer, professor of marketing, Chicago University, to the coin-operated machine manufacturing industry; Willits H. Sawyer, president of Stevens and Wood, Inc., to the railroad safety appliance industry; E. D. McGarry, professor of marketing, University of Buffalo, to the all-metal insect screen industry.

Fred B. Gleason, general commercial manager of the Western Electric Co., succeeds Walter A. Janssen for the office equipment manufacturing industry, and for the National Emergency Committee of the business furniture equipment and filing supply industry. Lieut.-Gen. H. K. Rutherford has been appointed to the wire rod and tube die industry; Major D. C. Cordiner to the metal window industry. Major M. K. Barrell will succeed George S. Brady for the rock crusher manufacturing industry, the shovel, dragline and crane industry, and the road machinery manufacturing industry. W. H. Calhoun, of Sears, Roebuck & Co., will succeed George S. Brady for the canning and packaging machinery industry. Ralph S. Smith, secretary of Bloomer Brothers Co., will succeed Beverly S. King for the warm air furnace manufacturing industry.

Horace B. Horton, treasurer of the Chicago Bridge and Iron Works will represent the administration on the code authority of the chilled car wheel industry; D. V. Stratton, president of the Johnson Motor Co., the cast iron boiler and cast iron radiator industry; Lieut.-Col. John W. Hallock, the pipe nipple manufacturing industry; and J. A. Craig, formerly manager of the Samson Tractor Co. and of the Janesville Machine Co., the farm equipment industry.

The following Army officers, who are on special duty in Washington, are to serve six months on the code authorities designated: Lieut. Col. Carl C. Oakes, fabricated metal products manufacturing and metal finishing and metal coating industry; Major R. W. Pinger, malleable iron industry; Major W. L. Clay, plumbing fixtures industry; Capt. Roy D. Burdick, cast iron pressure pipe industry. Capt. H. A. Wagner, cooking and heating appliance manufacturing industry.

Metal-Working Code Hearings Scheduled

Date	Place	Deputy Administrator	Association
March 14	Washington Hotel	K. J. Ammerman	Auto Rebuilders
March 14	Willard Hotel	G. S. Brady	Package Machinery Manufacturers
March 15	Mayflower Hotel	R. B. Paddock	American Watch Assemblers
March 16	Raleigh Hotel	R. B. Paddock	Optical Manufacturers (amendments)
March 19	Willard Hotel	G. S. Brady	Dealers in Used Textile Machinery and Accessories
March 19	Carlton Hotel	H. O. King	Lighting Rod Manufacturers
March 20	Mayflower Hotel	J. B. Weaver	Shipbuilding and Ship Repair Ind. Committee (amendments)
March 21	Willard Hotel	G. S. Brady	Abrasive Grain
March 23	Willard Hotel	G. S. Brady	Special Tool, Die & Machine Shop Institute (amendments)

Foreign Policies Move Forward

With the acceptance by George N. Peek of the presidency of the three banks, which grew out of the original Export-Import Bank plan, and the President's call on Congress to give him free executive power to negotiate reciprocal treaties with 50 per cent tariff reduction, the Administration's foreign policy took concrete form. Mr. Peek, former farm machinery executive and

A.A.A. administrator, now becomes virtual dictator of the country's foreign trade policies. The three banks he heads consist of that for Russia, previously announced, one for Cuba and one for the rest of the world, with possibility of further split-ups.

In his announcement accepting the presidency, Mr. Peek pointed out that the banks had not been "created as a Santa Claus to hand out presents at home and abroad." He is a firm advocate of balancing exports with imports so far as possible and has no faith in foreign trade based on loans that are never paid back.

For Mr. Peek, the banks are part of his broader plans which includes using the war trade board technique for "economic planning" in the widest sense for foreign trade. He believes he can so plan international exchanges through intelligently directed imports to clear away vast agricultural surpluses and also to pour American machinery into foreign countries which can use it and contribute not only to American but to world recovery. For this he wants the President's powerful aid in negotiating the reciprocity deals.

January Farm Equipment Exports Increase

Exports of agricultural implements during January were 81 per cent over a year ago, according to the Department of Commerce. In January, 1934, exports were $1,102,932 against $609,243 in January 1933 and $1,450,989 last December. This gain was largely accounted for by increase in foreign shipments of tractors.

Exports of wheel tractors during the month totaled 285, valued at $184,413, compared with 49, valued at $36,512 a year ago. January shipment of track laying tractors amounted to 127, valued at $253,721 compared with 32, valued at $47,107 in 1933. Parts and accessories recorded a moderate gain. In the harvesting machinery group, which contributed to the general rise, grain harvesters and binders totaled 133 units in January of the current year as against none in 1933.

Gray Iron Founders' Takes New Quarters

Enlarged office space on the tenth floor of the Public Square Building, 33 Public Square, Cleveland, Ohio, forms the new quarters of the Gray Iron Founders' Society, sponsor of the code of fair competition for the gray iron jobbing foundries. Arthur J. Tuscany is executive secretary of the society.

Durable Goods Committee Studies Unemployment

Following General Johnson's address to the code authorities and at his suggestion, a committee of twelve was selected to study the problem of unemployment in the durable goods industries. George H. Houston was appointed chairman; other members next chosen to represent various industries in this group were as follows: J. S. Tritle, electrical manufacturing; Alvan MacAuley, automobile manufacturers; R. W. Irwin, furniture manufacturers; H. Gerrish Smith, shipbuilding; George P. Torrence, machinery; S. F. Vorhees, construction; Charles Hook, iron and steel; C. R. Messenger, farm machinery; Lewis Brown, construction materials; J. R. Hoadley, gray iron; Walter J. Kohler, construction equipment; C. C. Sheppard, lumber; James W. Hook, machine tools; F. A. Lorenz, steel castings.

Heads NRA Committee

GEORGE H. HOUSTON

Machine Tool Member

JAMES W. HOOK

• INDUSTRIAL REVIEW •

• Despite the checks to activity caused by the code meetings in Washington and the threat of labor troubles, the machinery trade is optimistic. Although February was a short month and storms hampered salesmen in some territories, gross sales were apparently ahead of January. A shorter work week, if it comes, would work hardships in machinery production but these would be more than offset by the stimulation of markets that would be sure to result.

• The East reports a steady flow of small orders and a better tone to inquiries. Snow-clogged roads have unquestionably slowed things down somewhat. In Pittsburgh strike talk is diverting managerial attention from equipment buying plans. Orders are as scarce as are certain skilled trades. The shortage of men for such jobs as assembling, and operating boring machines, planers and large turret lathes, is worrying Cleveland. Otherwise there is little change. March, in Cincinnati, has opened up at a somewhat lower level than February, but prospects for sizeable orders are good and the trade is hopeful.

• Detroit, of course, is sitting on a dynamite keg. How NRA and the Labor Board handle the labor situation there will determine the course of business, not only in Detroit but in other cities where automotive parts are manufactured. Supply business continues in good volume but equipment orders of any size are few. In Chicago orders and inquiries continue at about the same rate as in February. St. Louis reports some inquiry but not much closing. Not much labor trouble in either of these districts just now. Milwaukee, of course, is concerned over the Nash and Seaman Body strikes. Many of the strikers want to return to work and there is consequently much dissension in their ranks. Machinery business has slackened somewhat in the last two weeks.

Herman Lind Speaks on Price Policies

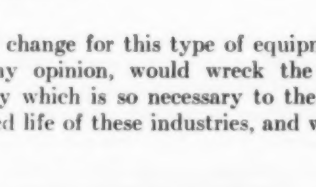
An able defense of published open prices was made by Herman H. Lind, manager of the National Machine Tool Builders' Association, in an address at the public hearing on NIRA. Mr. Lind outlined the stages by which wages had been progressively reduced by desperate vendors who were pitted against each other by large buyers of industrial supplies and materials. This condition, which was chiefly caused by the unfair tactics of a few recalcitrants, finally reached the low wages of labor and demoralization of business a year ago.

Referring to a suggestion that buyers unite for group action, Mr. Lind pointed out that this advantage was already a reality in the case of buyers for large and concentrated industries, mail order houses, department stores and chain stores. He suggested rather that buyers establish a code of fair competition outlawing the divulgence of competitive prices and the pirating of engineering or style designs.

"The Act was written and passed with the clear intent of enabling industries to work together in an effort to bring back fair wages, fair working conditions, fair trade practices, and prices under which industry might live," said Mr. Lind. "Published open prices are a means to that end. With the provision that there shall be no deviation from those prices, all customers will be treated fairly and without discrimination. Every buyer will know that no one else is buying from a given producer at a better price; consequently his effort will be directed to determining the real value of the product in proportion to the price offered him, instead of a chiseling operation between hungry competitors.

"In all these discussions," continued Mr. Lind, "consumer goods have received much emphasis. Let us consider for a moment durable goods, such as machinery and all sorts of equipment, where individual manufacturers determine and establish their own prices by listing them with their code authority, their trade and their competitors. Through this method, if a manufacturer sets his price too high, he loses business; if he sets it too low, he loses money. If he has reason to increase or to decrease his price, sufficient length of time should be given his trade and his competitors to know that a change will be made; also, that the price change is a matter of policy, and not a matter of temporary expediency for some immediate advantage.

"An insufficient period for notice of price change for this type of equipment, in my opinion, would wreck the firm policy which is so necessary to the continued life of these industries, and would put them right back where they were a year ago, forced to make lower and lower prices in order to meet progressive price cutting. It would give a few powerful buyers who proved to be the best traders a more favorable price than others could obtain. It would not be surprising, then, if the seller, when he felt he had an inside track in certain cases, would raise his price for a specific order, and then drop it back again, to the disadvantage of a given customer.



"The National Recovery Act was drawn and passed in order to place Industry in position to establish rules of fair business conduct; the Government to be the arbiter in their formulation, and the referee of their operation. The firm price, open price policy is the most important rule of all. It is the only honest way of doing business; it is fair to everybody; it is square; it eliminates waste; it creates confidence. Is it not then wise to encourage the efforts that industries are making through their codes to establish this principle in universal practice?"

Army Equipment Appropriation Increased for 1935

Adding almost $3,000,000 more than was asked, the House Appropriations Committee, in reporting out the War Department appropriation bill for 1935, gave the Ordnance Department $8,983,936.

The additional money, according to the committee, was placed in the bill "in order that at least some semblance of a start may be made in equipping the Army with modern combat cars for cavalry, providing the infantry with some tanks that will effectively and efficiently function, and in providing a reasonable supply of automatic rifles."

"These procurements, in conjunction with the motorized equipment to be provided out of the P.W.A. allotment constitute, in the committee's judgment, the biggest forward stride made by the Regular Establishment since the World War."

To insure that the money is expended for the new equipment. the committee placed a proviso in the bill requiring that of the total appropriation $2,790,000 shall be available exclusively for procurement of complete combat cars and medium and light tanks, and for the procurement of automatic rifles, including the purchase or manufacture of gages, dies, and jigs for use in connection with the production of such rifles, all in addition to such types of procurement as may be made in connection with research and development.

For repairs and improvements of ordnance establishments, and to meet unforeseen expenditures as accidents or other contingencies may require, the committee set aside $694,831 of the total appropriation for ordnance. It also set aside $70,100 for development and procurement of gages, dies, jigs, and other aids and appliances.

In testimony during hearings on the Ordnance department appropriation, Major General Samuel Hof, Chief of Ordnance, estimated that the appropriation for 1935 would necessitate cutting arsenal forces to 4,000, the smallest in the past 25 years, even though rapid strides of science have constantly increased the duties and responsibilities of the department to keep abreast of other countries.

He characterized the situation as "a serious blow to munitions preparedness, in keeping alive the art of munitions manufacture in this country, and any further reduction will necessitate placing our manufacturing arsenals on practically a caretaker's basis."

It was also revealed in testimony at the hearings that "through an inadvertance" the War Department made public a statement to the effect that it was to get $2,300,000 from the P.W.A. for modernization of ordnance machine tool equipment. According to Major General Hof the department was unable to procure the money.

Army Spends Funds for Motorization

Funds allotted to the Ordnance Department of the Department of War by the Public Works Administration have been almost completely expended for new equipment. Purchases were made on the basis of bids submitted on specifications furnished by the Ordnance Department.

A list of the equipment bought and the successful bidders follows:

The Cleveland Tractor Co., $24,500 for twenty 15-hp. tractors.

The Linn Manufacturing Corporation, $73,829 for six half-track trucks.

General Motors Truck Co., $74,811 for 22 half-track trucks.

The White Co., $247,365 for 76 scout cars.

James Cunningham Sons & Co., $135,000 for 26 half-track cars.

The Martin-Parry Corporation, $178,011 for 540 high-speed adapters.

Bids will probably be let soon on ten 30-hp. tractors. The first set of bids on this equipment were rejected because they were identical, it was stated.

Philadelphia Machinery Dealers Organize

Under the name Philadelphia Machinery Distributors, an association has been formed as a permanent institution for the sellers of machine tools in that district. Officers are: president, N. P. Lloyd, Lloyd & Arms, Inc.; treasurer, J. L. Stewart, W. E. Shipley Machinery Co.; secretary, D. M. McCracken, Swind Machinery Co. With one exception, all members of the machinery distributing trade in the Philadelphia area are members.

German Machinery Industry Improves

With but two exceptions, Germany's machinery industry showed an improved output each month during 1933 over the corresponding months of 1932. As is the case of so many German industries, the machine manufacturers owe the 1933 improvement entirely to increased domestic sales. Although there was a slight improvement in export business during the last half year, each month foreign shipments were lower than during the corresponding month of 1932.

To regain its 1931 position, German machinery must experience a continuation of improvement in the domestic market, and also a much greater export trade. There are few signs now that Germany's foreign business will improve in the near future. Nevertheless, the industry was able to show an export surplus during 1933 only about 29 per cent below that of 1932. This was maintained by a close guard over imports, which were kept below the totals of 1932 and far below preceding years.

CORPORATION • REPORTS •

Autocar Co.
For 1933, net loss $317,219; for 1932, net loss $1,077,641.

Blaw-Knox Co.
For 1933, net profit $111,666; for 1932, net loss $671,966.

Borg-Warner Corp.
For 1933, net profit $1,196,270; for 1932, net loss $598,300.

Bridgeport Machine Co.
For 1933, net profit $50,414; for 1932, net profit $44,754.

Briggs & Stratton Corp.
For 1933, net profit $252,067; for 1932, net profit $30,689.

Burroughs Adding Machine Co.
For 1933, net profit $1,304,557; for 1932, net profit $655,329.

Cleveland Welding Corp.
For 1933, net income $42,036; for 1932, net loss $68,913.

Compo Shoe Machinery Corp.
For 1933, net income $184,217; for 1932, net profit $124,341.

Crane Co.
For 1933, net loss $1,874,823; for 1932, net loss $7,536,868.

Detroit-Michigan Stove Co.
Five months ended Dec. 31. Net profit $33,273; corresponding period previous year, net loss, $162,000.

Electric Controller & Mfg. Co.
For 1933, net loss $79,150; for 1932, net loss $369,889.

Evans Products Co.
For 1933, net income $297,126; for 1932, net loss $250,943.

Geometric Stamping Co.
For 1933, net loss $47,533; for 1932, net loss $264,319.

Graham-Paige Motors Corp.
For 1933, net profit $66,997; for 1932, net loss $2,810,852.

Harnischfeger Corp.
For 1933, net loss $643,030; for 1932, net loss $893,685.

Hobart Mfg. Co.
For 1933, net profit $273,577; for 1932, net loss, $87,855.

Hoskins Mfg. Co.
For 1933, net profit $125,615; for 1932, net profit $56,774.

Landers, Frary & Clark Co.
For 1933, net profit $236,409; for 1932, net loss $75,915.

Link-Belt Co.
For 1933, net profit $216,644; for 1932, net loss $970,121.

Lockheed Aircraft Corp.
For 1933, net profit $25,691; from formation, June 21, 1932, to Dec. 31, 1932, net loss $9,947.

Mack Trucks, Inc.
For 1933, net loss $947,909; for 1932, net loss $1,479,598.

Marion Steam Shovel Co.
For 1933, net loss $570,562; for 1932, net loss $678,424.

Marlin-Rockwell Corp.
For 1933, net profit $110,535; for 1932, net loss $123,388.

Maytag Co.
For 1933, net income $1,204,503; for 1932, net profit $100,773.

Minneapolis-Moline Power Implement Co.
For 1933, net loss $1,544,566; for 1932, net loss $3,107,821.

Motor Wheel Corp.
For 1933, net profit $122,168; for 1932, net loss $1,186,751.

National Acme Co.
For 1933, net loss $311,056; for 1932, net loss $895,458.

National Pump Co.
For 1933, net loss $136,166; for 1932, net loss $179,184.

Niles-Bement-Pond Co.
For 1933, net loss $276,643; for 1932, net loss $63,493.

New York Shipbuilding Corp.
For 1933, net loss, $24,322; for 1932, net profit, $1,328,191.

Pierce Governor Co.
For 1933, net loss $12,045; for 1932, net loss $22,454.

Pittsburgh Screw & Bolt Corp.
For 1933, net loss $143,700; for 1932, net loss $799,680.

Scovill Mfg. Co.
For 1933, net profit $305,688; for 1932, net loss, $1,322,933.

Servel, Inc.
Quarter ended Jan. 31, loss $160,888; same quarter last year, loss $240,799.

Sparks-Withington Co.
Six months ended Dec. 31, net loss $164,456, similar period 1932, net loss $200,996.

L. S. Starrett Co.
Six months ended Dec. 31; net profit $12,495; same period previous year, net loss $111,606.

Sullivan Machinery Corp.
For 1933, net loss $590,679; for 1932, net loss $1,229,517.

Sundstrand Machine Tool Co.
For 1933, net loss $79,704; for 1932, net loss $154,414.

Timken-Detroit Axle Co.
For 1933, net loss $1,256,869; for 1932, net loss, $1,193,873.

Trico Products Corp.
For 1933, net profit $1,418,277; for 1932, net profit $964,964.

Walworth Co.
For 1933, net loss $865,879; for 1932, net loss $1,306,573.

Worthington Pump & Machinery Corp.
For 1933, net loss, $1,184,642; for 1932, net loss $1,668,287.

• PERSONALS •

T. W. BURNS, works manager since 1926 for the main plant of Fairbanks-Morse & Co., Beloit, Wis., has resigned to become a manufacturing executive of the A. O. Smith Corp., Milwaukee.

R. E. SAVELAND has been made general superintendent of the Fairbanks-Morse & Co., plant at Beloit, succeeding T. W. BURNS, resigned.

EVERETT CHAPMAN has been elected vice-president of Lukenweld, Inc., division of Lukens Steel Co., Coatesville, Pa. Mr. Chapman joined the company in 1930 as director of engineering and research, and has been credited with

responsibility for that organization's engineering achievements in the application of welded steel construction to diesel engines, presses, planers, lathes and other machinery and equipment.

W. J. PATTERSON was appointed director of the Bureau of Safety of the Interstate Commerce Commission on March 1. He succeeds W. P. BORLAND, retired. T. C. HAYS was advanced to the position of assistant director vacated by Mr. Patterson.

ROBERT J. PARDEE, who recently joined the Cleveland Punch & Shear Works Co., Cleveland, Ohio, has resigned with the intention of taking a rest. Mr. Pardee was previously connected with the Toledo Machine Tool Co. for 17 years.

WALTER B. WEISENBURGER, president of the St. Louis Chamber of Commerce, was appointed executive vice-president of the National Association of Manufacturers, according to an announcement by CLINTON L. BARDO, president. Mr. Weisenburger will assume his new duties about April 1.

R. A. ZILM, formerly domestic and European sales representative for the Lees-Bradner Co., Cleveland, is now affiliated with the Cleveland Duplex Machinery Co., Inc., Cleveland, in the sale of machine tools and special machinery.

• OBITUARIES •

GEORGE B. BEALE, formerly connected with the Chicago office of the Brown & Sharpe Mfg. Co., died at Oakland, Calif., on February 24. Mr. Beale first joined Brown & Sharpe in 1872. After making several other connections he returned in 1892 as salesman at Chicago.

GEORGE C. REILLEY, a supervisor of small tools and gages at the Schenectady Works of the General Electric Co., died

March 5 at the age of 63. Mr. Reilley had been an employee of the company and its predecessor, the Edison Machine Works, for 40 years. He was considered an authority on small tools and wrote a number of articles for *American Machinist*.

MICHAEL M. MCINTYRE, founder of the Perfection Spring Co., died February 28 at the age of 75. In 1906 he founded the company which is now a part of the Eaton Axle & Spring Co., and retired five years ago.

LAWRENCE M. MANION, 57, president of the Manion Steel Barrel Co., Oil City, Pa., died March 7.

B. PERRY REMY, founder and former head of the Remy Electric Co., Anderson, Ind., died February 27, at the age of 57. He retired in 1911.

WILLIAM H. VAN HORN, who was vice-president of the C. M. Kemp Manufacturing Co., Baltimore, Md., until his retirement in 1930, died February 23.

JAY GAMMILL WEISS, former president of the Hyatt Roller Bearing Co., Newark, N. J., died March 1.

• BUSINESS ITEMS •

The Bundy Tubing Co., Detroit, has announced organization of a subsidiary known as H. W. Bundy, Inc., which will take over the copper-hydrogen-electric-welding production of commercial parts other than tubing. Offices will be maintained in the plant of the parent company at 10951 Hern Avenue. Manufacturing will be done in the former Bundy plant at 4815 Bellevue Ave. Officers of the new company are: W. W. ANDERSON, president; T. M. RUDE, vice-president; A. C. WINGER, secretary and treasurer, and H. J. BLAIR, superintendent.

The City Machine & Tool Works, Dayton, Ohio, has acquired the Paulins Tool & Engineering Co., Detroit, Mich., manufacturers of standard drill jigs and standard locks, and will build these products under the trade name of "Cimatool-Paulins." Stocks will be maintained at the factory in Dayton and at the Detroit office, 410 Stormfeltz-Loveley Bldg., 7310 Woodward Ave. FRANK U. PAULINS remains at the Detroit office in an engineering and sales capacity.

The Robins Conveying Belt Co., New York, N. Y., has acquired the coal and ore handling machinery business of the Mead-Morrison Manufacturing Co., Boston, to be operated henceforth as the Mead-Morrison Division of the Robins Conveying Belt Company. Equipment is being transferred from Boston to the Robins Works at Passaic, N. J.

The Reiss Manufacturing Co., makers of tools for garages and automobile service stations, has been reorganized and the offices moved from Dayton, Ohio, to Kokomo, Ind. LOUIS F. FEE is president; JOHN C. HELVIE, vice-president, and W. H. MEAD, secretary and treasurer.

The Chain Belt Co., Milwaukee, has completed transfer to Milwaukee of the manufacturing operations of its wholly owned subsidiary, The Stearns Conveyor Co., Cleveland, Ohio.

WILLIAM K. STAMETS, Pittsburgh machine tool dealer, has appointed HAROLD W. GOLDEN as district manager of the Cleveland branch, located in the Rockefeller Building. Mr. Golden joined the Stamets organization in 1927 as sales engineer, and prior to that time was employed for 12 years on engineering and production work.

Udylite Process Co., Detroit, Mich., has appointed HAROLD W. FAINT to its sales engineering staff, with headquarters in Chicago. He was previously connected with the Crowe Name Plate & Mfg. Co., Chicago, as chemical engineer in charge of special metallurgical and finishing problems.

Uses of Carbon Tool Steels

Courtesy of the Midvale Company

Carbon—0.60 to 0.70

Use where a keen edge is not necessary, as for:

Brick chisels	Rivet sets
Drop hammer dies	Setscrews
Gardening tools	Tongs
Granite wedges	Valve links
Pick points	Key steel

Forge at 1,600 deg. F. Harden at 1,410-1,450 deg. F.

Carbon—0.70 to 0.80

Combines toughness with considerable degree of hardness. Use for:

Anvil faces	Pneumatic hammer tools
Blacksmiths' hammers and tools	Shear blades (large)
Bucket teeth	Tongs
Cold chisels	Wrenches
Logging tools	Rivet sets
Mining drills	

Forge at 1,600 deg. F. Harden at 1,400–1,440 deg. F.

Carbon—0.80 to 0.90

Combines toughness with hardness. Use for:

Ball peen hammers	Pneumatic hammers
Beading tools	Cylinders
Cruciform drill steel	Quarry drills
Hand chisels	Shear blades
Hot chisels	Spring steel
Punches	Vise jaws

Forge at 1,600 deg. F. Harden at 1,390-1,430 deg. F.

Carbon—0.90 to 1.00

Combines hardness with toughness. Use for:

Cant dogs	Machinists' hammers
Cold heading dies	Pocket knife blades
Forming, punching and trimming dies	Shear blades (small)
	Spring steel

Carbon—1.00 to 1.10

For tools in which hardness is prime consideration. Examples:

Axe bits	Lathe centers
Collets	Moulders' tools
Coining dies	Scythe edges
Flat drills	

Forge at 1,600 deg. F. Harden at 1,390-1,430 deg. F.

Carbon—1.10 to 1.20

For use where hardness is prime consideration. Examples:

Ball bearings	Reamers
Cold cutting dies	Silversmiths' dies
Drawing dies	Taps
File cutting chisels	Plug drills
Flat or twist drills	Woodworking knives
Lathe and planer tools	

Forge at 1,500 deg. F. Harden at 1,385-1,430 deg. F. Small tools should be treated in oil.

Carbon—1.20 to 1.30

Tools for which hardness or a keen cutting edge is necessary. Examples:

Brass turning tools	Reamers
Cabinet files	Stone planing tools
File cutting chisels	Wire drawing dies
Granite chisels and points	Wood turning tools

Forge 1,500 deg. F. Harden at 1,385-1,430 deg. F. Small tools should be treated in oil.

Carbon—1.30 to 1.40

For use where a keen edge is of prime importance. Examples:

Boring and finishing tools
Cutters
Wire drawing dies

Forge at 1,500 deg. F. Harden at 1,385-1,425 deg. F. Small tools should be treated in oil.

Heat-Treatment

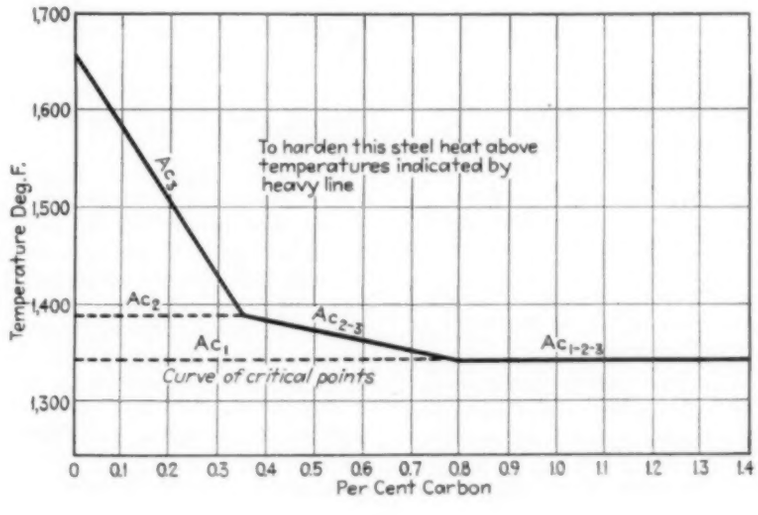
ANNEALING—Carbon tool steel to be annealed should be heated uniformly and slowly to 1,400 deg. F., and not in direct contact with the fire. It should then be buried in air-slaked lime, dry sand, fine ashes or other poor conductor of heat. If the pieces are small, the covering material should be heated, or they can be placed while hot between two pieces of pine wood and buried as previously stated. Do not remove until cold. If the forgings are thick-walled or of complicated shape, the best practice after rough machining is to quench them in oil from a temperature slightly above the critical point and temper them below the critical range, at about 1,250 deg. F. Final hardening can then be done without distortion.

HARDENING—Heating for hardening must be uniform, the degree be governed by the carbon in the metal. High carbon steel is heated to a lower temperature than low carbon steel. See accompanying curve. If tool steel is slightly over-heated, let it cool down to a black condition and reheat for hardening; never let it cool to the proper temperature and then quench. Intricate sections are often hardened in oil and it may be necessary to go from 50 deg. to 100 deg. above the hardening temperature proper for water.

Tempering Table

Temperature for 1 Hr. F.	Temperature for 1 Hr. C.	Color	Temperature for 8 Min. F.	Temperature for 8 Min. C.	Suggested Uses
370	188	Faint Yellow	460	238	Scrapers, brass turning tools, reamers, taps, milling cutters, saw teeth.
390	199	Light Straw	510	265	Twist drills, lathe tools, planer tools finishing tools
410	210	Dark Straw	560	293	Stone tools, hammer faces, chisels for hard work, boring cutters.
430	221	Brown	610	321	Trepanning tools, stamps.
450	232	Purple	640	337	Cold chisels for ordinary work, carpenters' tools, picks, cold punches, shear blades, slicing tools slotter tools.
490	254	Dark Blue	660	349	Hot chisels, tools for hot work, springs.
510	265	Light Blue	710	376	Springs, screw drivers.

NOTE:—It will be noted that two sets of temperatures in Fahrenheit and Centigrade degrees are shown, one being specified for a time interval of eight minutes, the other one hour. Articles to be tempered should be placed in the bath, the temperature then being brought up to that shown in the table and held for the time required. This method gives results far superior to the old, and the long draw at the lower temperature will put the steel in the best condition of all.



NEW BOOKS

★ ★ ★

METALLURGY OF IRON AND STEEL. *Bradley Stoughton, 559 pages, 6x9 in. Cloth. Published by McGraw-Hill Book Co. Inc., 330 West 42nd St., New York, N. Y. Price $4.*

Throughout the text the author has refrained from using the technical terminology found in so many texts on this subject. Although the major part of the book is concerned with the history and the processes of iron and steel manufacture, several chapters are of particular interest to shop executives. An especially valuable chapter is that giving an accurate explanation of the iron-carbon diagram in a non-technical but accurate treatment. Another chapter on alloy steel and alloy cast iron stresses physical properties and applications rather than steel making processes, and should be of real assistance. Much fundamental data bearing on the problem of selecting materials are contained in two chapters on the constitution and heat-treatment of steel and two chapters on cast iron.

★

GERMAN-ENGLISH TECHNICAL DICTIONARY OF METALLURGY. *By Henry Freeman. 327 pages, 5x7 inches, flexible binding. Published by Otto Spamer Verlag G.m.b.H., Leipzig, Germany. Price Rm. 25.*

A technical dictionary that contains the technical and shop terms of the metal-working industry, as this one does, should be useful to anyone who wishes to follow German literature or who is engaged in trade with Germany. This first section includes only the German terms and their English equivalents. It is concise and handy.

★

PROCEEDINGS OF THE AMERICAN SOCIETY FOR TESTING MATERIALS—1933. *Part I, reports with appended papers, new and revised tentative standards, and revisions of standards. Part II, technical papers. Published by the American Society for Testing Materials, 260 South Broad St., Philadelphia, Pa. Prices of volumes: $5.50 per part in paper binding; $6, cloth; $7, half-leather.*

Part I of the 1933 proceedings contains the annual reports of 40 standing committees, and research and sectional committees. During 1933, 47 specifications and methods of testing covering widely used engineering materials were published for the first time. All of these, together with 37 other tentative standards, which were revised during 1933, are given. Among subjects discussed and reports of interest to the ferrous metal field are: a 50-page section on cast iron containing what is probably one of the most comprehensive series of data on the physical properties of cast iron ever assembled in this country. Other information is given on heat-treatment and corrosion.

Part II contains all of the formal technical papers presented at the 1933 annual meeting with extensive discussions. Several of these papers discuss development and application of tests for specific properties of metals. An outstanding contribution is that known as "Symposium on Cast Iron" jointly sponsored by the American Foundrymen's Association and the A.S.T.M., and comprising 160 pages.

★

INDUSTRIAL RADIOGRAPHY. *Ancel St. John and Herbert R. Isenburger. 230 pages, 6x9 in. Cloth. Published by John Wiley & Son., Inc., 440 Fourth Ave., New Yorw, N. Y. Price $3.50.*

Two recognized experts in industrial applications of X-rays discuss practical uses of radiography in a concise manner. Seven chapters take up the development of X-ray equipment and the properties of X-rays, and describe industrial uses for X-ray apparatus with emphasis on the economic possibilities. Detailed instructions follow on steps in making radiographs and interpreting them, with special treatment regarding large castings, forgings and welded vessels. For the shop executive X-rays can point the way to better welding methods with resulting improvement in product.

★

AMERICA SELF - CONTAINED. *By Samuel Crowther. 340 pages, 5¼x8 in., bound in cloth boards. Published by Doubleday, Doran & Co., Inc., Garden City, New York.*

Here is the case for the establishment of a national economy free from reliance on any other country or region for raw materials or goods of any sort, and from financial entanglements with other nations, debtor or creditor. Mr. Crowther takes sharp issue with the Internationalists and those economists who adhere to the old British theory of the benefits of free trade. He does not insist on abolition of all trading with other countries but he does plead for the establishment of a set of national books of account that will enable us to decide whether any particular venture or transaction is economically justifiable.

Figure after figure is quoted to show that economic nationalism and our exports of production machinery have made any return to the old trading lines and volumes impossible. The author points out that scientific research has opened the door to freedom from the old dependence on foreign sources of certain basic materials, and begs us to enter into that freedom and work out our own destiny without the interference of lower-standard countries.

This book should be read by every executive who is interested in foreign trade or a foreign plant, and particularly by the machinery manufacturers whose exports are doing so much to close export markets for manufactured consumers' goods.

Steel Ways and Scraping Discussion

CHARLES NORTHEY
North Wembly, Middlesex, England

In discussing John R. Godfrey's contribution in Seen and Heard (*AM*—Vol. 77, page 638), Robert S. Alexander in an article under the title given above (*AM*—Vol. 77, page 812), criticizes the expensive method of scraping as against the cheaper one of grinding.

I suggest to Mr. Alexander that in machine tools as apart from the everyday types of mechanical appliances, the first cost is the least important point. Examining his criticism I find that he refers to the low spots left by scraping as collectors of loose filings and fine chips, but a little more experience will prove to him that ground surfaces also do this and what is more owing to the inability of the ground surface to retain oil, the chips and the swarf score both the sliding and the stationary parts of the machine. The question of chips and swarf is not one of surface, but of efficient management in seeing that costly machines are kept properly clean.

In regard to scraping and grinding I can say very definitely from experience with both that scraping gives greater longevity to sliding parts than does grinding. If Mr. Alexander cares to get in touch with me through the editor I can show him machines having both types of surfaces, and the results to each from years of wear. The reason for the longevity of scraped surfaces is undoubtedly the question of lubrication, and when machines 30 years old have the scraping still visible, and in other cases machines less than six years old have ground surfaces scored, I believe scraping is better.

THE ROUND TABLE

What Share?

"Say, Ed, what do you call the fair share of labor in industry?"

"What do you mean, fair share of labor in industry?"

"Oh, a lot of people, yourself included, have been bellowing that labor doesn't get its fair share, and that profits ought to be more fairly distributed. Taking your view of the case, what would you call a fair share?"

"I wouldn't know what to say about that, Al, without giving it more thought."

"You made the assertion that labor was not getting a fair deal without giving the matter any thought. Is that what you're trying to say?"

"I suppose that's what it amounts to."

"Well, you're no better and no worse than the rest of them. Not one that I've asked has any idea of what a fair share is, or whether labor deserves it. Some of those I talked to said that labor should get a bigger share, but did not know how much bigger. I asked them why, and most of them didn't have any answer to that except 'because.' One or two said 'because labor produces the profit.' But they couldn't tell how."

"Yeah, that's a favorite trick of yours, Al. You ask questions that a fellow's not expecting, and he gets balled up and can't answer."

"You're wrong, Ed. I asked questions because I really want to know. The great majority of people have only a sketchy knowledge about things, but they'll make definite statements that they can't back up."

"That may all be, but a man is entitled to his opinion, isn't he, without investigating a thing thoroughly? If a man had to do that every time, he wouldn't have many opinions."

"Granted, but he'd know a darn sight more. Take the Tom Mooney case, for instance; you swear he is innocent, so do half the people in this country. The other half think just as positively that he is guilty. You can start a fight on that subject any day, and neither side can be sure, nor do they try to be sure. Just so with this division of profits idea. Old Colonel Groudy spouted about it an hour at the Chamber of Commerce dinner, but when I asked him for some concrete information, he couldn't give it. I bet you've better ideas on the subject than he has."

"A compliment from you is a compliment indeed. Ask on."

"Well, where should this extra share of profits come from? Should the foremen, superintendents and managers have their salaries reduced and share the deductions with the men? If so, how much more would the men get?"

"I don't think the men have any such idea as that. They don't begrudge what the shop executives get."

"All right, they don't create the profit then, do they? Any more than a private wins a battle. During the war we had better soldiers than Napoleon had. We had more of them, but unfortunately we didn't have a Napoleon to lead them. Look at what organized labor pays its own leaders."

"Oh I don't know, Al. I think common people can get along without leaders. They soon find one."

"Yes. That's the point I make. We must have leaders and we must pay them. All right. Do you think labor should get some of the profits that stockholders get?"

"Yeah, that's what many of the men think."

"Well, let's see how that would work out. A stockholder gets a dividend on the number of shares he owns, or in other words, on the amount of money he has paid into the firm. A firm must have money just as it must have labor, and it must pay for both. The only difference is that the stockholder runs the risk of not getting his pay. Now, suppose we consider labor on the same basis as money. What the average worker expects is what the average man hopes for: To win on a long shot; to find a big bit of money, or win in a lottery. Justice doesn't enter.

What is labor's share?
How can a firm be fair?

Discussion

Averaged Dividends?

The average of the earnings of several years is far better than running the business on the single-year basis. Industry is now recovering as much from overwatered capitalization and over-dividend-milked capital as it is from the depression.

A dividend of six per cent on the par value of stock in general would be very fair. Perhaps it could be boosted to eight or nine per cent in bumper years. Each year, from ten to fifteen per cent of the profits above dividends and workers' bonuses should be set aside for the major officials of the organization. The balance should then be carried to surplus. Thus, when a six per cent dividend and the workers' bonuses are not earned, the officials' gravy would be out. The tendency to grab everything in sight must be curbed.

During the next decade we will see

if the trying fires of the past five years have brought out any worthwhile, fearless and progressive business leaders.

—E. E. GAGNON,
Mechanical Superintendent, Raybestos-Manhattan Company.

Whither Are We Bound?

Ed and Al touched on a mighty interesting subject and one that has wide opportunities for discussion. Just where we are bound is a question no one can answer. When one plan fails repeatedly we try new ones, and while we usually go to extremes and then swing back, we never go back to the old plan, and we will not do so this time. How far we go toward socialized control depends more on the standpatters than it does on the so-called radicals. The more obstacles the conservatives throw in the way of any change, the farther we will go away from the old methods of letting business run itself.

We have only to read history to know that nearly all revolutions have started from hunger. Fortunately we have become humane enough to attempt to relieve distress from unemployment. Where we go depends largely on how wisely we solve the question of unemployment. Many employers are realizing that we must either furnish opportunities for employment or feed people who are without a job. The old plan failed utterly and with disturbing regularity. Safety for those who have depends on some plan that will satisfy those who have not. Where we are going is not clear. But whether we like it or not we are on our way, and blind opposition will only carry us farther along new paths. —R. E. MARKS

We are on the threshold of a new era. Business has struggled desperately with the problem of dwindling revenues during the greater part of the last four years without any appreciable success in stemming the tide. The most outstanding authorities on economics have advanced theories. What has been the net result? Nothing, except a great deal of talk and very little, if any, action.

The government, realizing in time the futility of the unorganized attack being made on so many fronts, took unto itself the task of at least unified supervision. This work has been exemplified through the medium of NRA. After all, it must by this time seem natural that the government should step into the fray, for in all crises of national scope, the court of last resort will always be the voice of the people speaking through their government agencies.

These facts being fundamental, it is not strange that during the last year we have witnessed many revolutionary changes in business procedure. Frankly, does it not seem reasonable that all of the codes, hours of work, prices of output, are nothing more than a determined means of restoring to the masses a sort of psychological confidence that was sadly depleted? It is only through a vital transition that the purchasing power of the greatest number can be realized.

It is true that government supervision may have jeopardized the activities of many of the giants of industry. But, on the other hand, someone had to be hurt, and it was probably felt that this set could temporarily take the bump better than anyone else. In the last analysis anything that can be done to enhance the purchasing power of our people will, sooner or later, react to the

ultimate benefit of all business enterprise. If one would be thoughtful of the facts as presented, he would find it exceedingly difficult to agree that the methods of the past were the answer to universal prosperity.

—HAROLD L. WYNN,
Executive Engineer, Pacific Electric Mfg. Corporation.

No Inventory

In taking inventory every shop I know counts only material things such as machine equipment, tools and parts in stock or in process. Generally speaking it tries to count the value of the things which can be most easily replaced. The inventory ignores good will of both customers and men in the shop, and the available man power. And according to recent reports from various sections a shortage in skilled labor is the greatest handicap at present.

If this is the case, and it is perfectly natural that it should be so, would it not be equally valuable to have an inventory of available labor and to know whether it was likely to stick if demand for men became more urgent? This, of course, comes under the head of personnel work, which has either been abandoned, or so crippled as to have very little value. If lack of skilled men is hindering the making of machines for which there is an insistent demand, isn't a knowledge of the amount and kind of labor that can be depended on even more important than the number of castings or pounds of new machine stock in the plant on a certain date?

Such an inventory will show a decided shortage of skilled men in most machine building centers. And in too many cases nothing is being done about it. If such a shortage were found in materials, immediate action would be taken to remedy it. But when it comes to training men most shops still look for a Santa Claus to drop them down their chimney. An inventory of really good men available in a community might show the necessity of keeping training schools going even in slack times, as we do public schools. It might also make it seem advisable to inaugurate some method by which men would be kept in reserve just as we do with machine equipment.

—CLIFFORD H. FRENCH

Inventory is a bugbear in too many shops. It frequently comes at the busy season and by the old method the shop men were laid off while the foremen and office help worked overtime—and cussed when the boss wasn't around. We probably have Frederick Taylor to thank for the running inventory. But whether he invented it or not he emphasized the advantages and made people think about it.

In some cases taking inventory is just a way of bolstering up the balance sheet to make the stock holders feel better. So far as economical shop operation is concerned it's often a flat failure. If you depend on a yearly inventory to know that you have parts enough to keep going, the plant needs a new manager. This means that you either carry too much stock or that you are likely to have orders held up at any time.

A running inventory is necessary for the economical operation of any plant. It doesn't need to be elaborate or a duplicate set of storage bins as Taylor sometimes advised. The amount of inventory needed depends largely on the size of the shop and the product. If the product is a small device made up of a number of small parts, a running inventory can be easily kept by simply putting the parts made in one column and the parts used in another, on a stock card or sheet. A clerk with a small portable adding machine can get the totals in short order. For larger work it is often possible for the foreman to know from day to day just how the parts are coming. In too many cases inventory is just a hangover from old methods that may as well be abandoned. It is another legacy of old-fashioned accounting. And inventories cost money. One manager told me recently that if he had not taken inventory he would have just squeezed on to the black side of the ledger. As it was, the cost of the inventory put him $87 in the red.

—I. B. RICH

· IDEAS ·
FROM PRACTICAL MEN

Machining Rectangular Holes

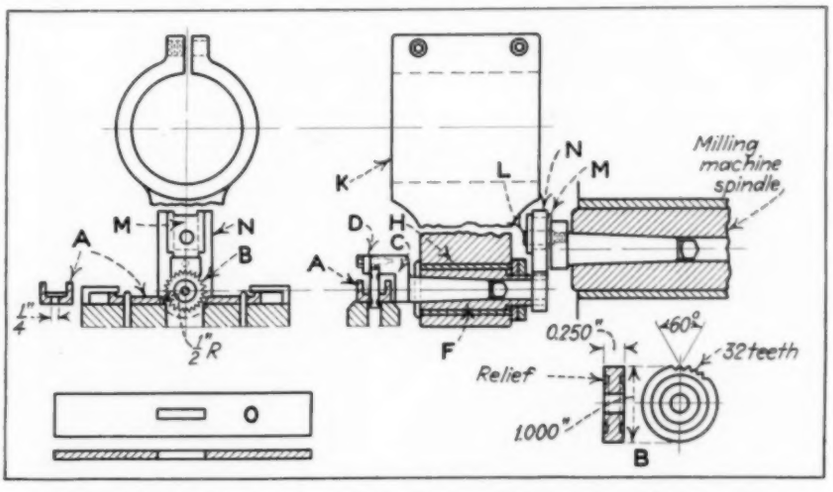
C. W. HINMAN

In certain parts used in telephone switchboards, cored, rectangular holes having square, sharp corners had to be machined, the ends of the holes being left with arcs of short radii in the direction of the thickness of the metal. The work could not be done with regular milling cutters, as the cutter arbor would interfere with the work and prevent the necessarily small cutter from sinking deep enough into it.

To overcome the difficulty, we made the grubbing device illustrated, in which the work is indicated at *A* and the cutter at *B*. The cutter is 1 in. in diameter and has 32 teeth, each of 60-deg. included angle, and is relieved for side clearance, as shown in the view in the lower right-hand corner. The cutter is held by fitting six of its teeth in the rocker arbor *C*, and by the clamp *D*, which is omitted in the view at the left to show the fitting of the cutter teeth. The rocker arbor has a taper shank and is provided with a flat tang for positive driving. It is mounted in the short spindle *F*, which runs in the bushing *H*.

This mechanism, in turn, is supported in the bracket *K* secured to the overarm of the machine. Both the rocker arbor and the cutter are oscillated by the crankpin *L* working in a hole in the sliding block *M* in the arm *N*, the lower end of which is keyed to the short spindle *F*. The crankpin is held in the end of a stub arbor in the machine spindle and has a throw of ¼ in. The work is clamped in a holding fixture and is fed to the oscillating cutter by raising the knee of the machine. When one part of the cutter becomes dull, it can be unclamped and shifted to present sharp teeth to the work.

When rectangular holes are to be machined in thin work without leaving arcs at the ends, as in the piece at *O*, the full diameter of the cutter must pass through the work. In that cast, more side clearance must be given the rocker arbor to clear the surface of the work behind the portion that holds the cutter. Variations in the design of this device can be employed to grub holes in many otherwise inaccessible places.



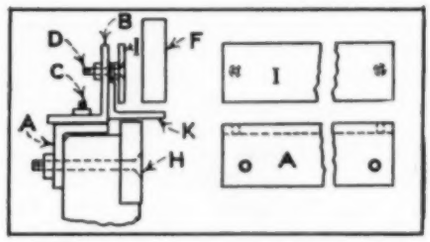
Rectangular holes can be machined by sinking the grubbing cutter through the work. The cutter is mounted on a rocker arbor and is oscillated by a crankpin held in a stub arbor in the machine spindle

Shearing Angle Iron Lengthwise

C. B. DEAN

In many railroad shops, the need for economy has made it necessary to shear available stocks of angle iron lengthwise in order to secure the desired leg lengths. The operation is difficult and often dangerous when ordinary shear equipment is used unless some special attachment is available.

Such an attachment is shown in the illustration. It is simple, can easily be made, and has proved its worth in the shop of one western railroad where a quantity of angle irons of the same size were to be sheared lengthwise. The angle plate *A* is anchored by the bolts holding the lower blade of the shear and forms a connection and a support for the angle plate *B*, which has a series of holes to receive the bolts *C* and *D*. These holes are required for adjusting the angle plate *B* in relation to the cutting edges of the shear blades *F* and *H*, and also to raise or lower the guide plate *I* to accommodate various sizes of angle irons to be sheared.



Where many pieces of angle iron of the same size are to be sheared lengthwise, this attachment to the shear will prove its worth

The space between the angle plate *B* and the guide plate *I* is regulated by adding or removing thin washers. By reversing the position of the angle plate *A*, a still greater variation of space can be obtained between the guide plate and the upper blade of the shear. Slight adjustments can also be made by inserting thin washer plates between the angle plate *A* and the side of the shear bed. At *K* is an angle iron in position for shearing. In shearing pieces of angle iron that are longer than the shear blades, it is advisable to cut the bars to the desired length before shearing.

Fitting Nuts by Measurement

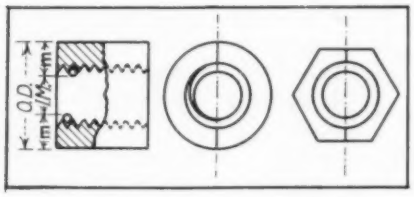
WILLIAM C. DRONBERGER
Instructor Mechanical Arts, Cass Technical High School

A workman in one of the smaller shops in our city asked my assistance in helping him out of trouble on a repair job. His trouble resolved itself into a means for replacing several damaged nuts on a large machine undergoing repair. The bolts to which the nuts belonged could not be removed without completely dismantling the machine, so that to make new nuts by the "cut and

try" method was out of the question, therefore, the "cut to measure" method was decided upon.

The first steps required accurate measurements for the pitch diameters of the bolt threads, all of which conformed more or less accurately to the National 60-deg. thread form, and the actual pitch diameters of the various sizes were listed for reference. Four of the nuts were round and had spanner grooves, while the others were of the usual hexagon shape.

For working purposes, limiting dimensions were computed with an objective pitch diameter for each of the actual pitch diameters, plus one-half of the tolerance for a Class-III fit, that is, sufficient to offset the errors of angle and lead. The problem was now to find a simple method for measuring the



These nuts were made from measurements of the pitch diameters of the bolts, a single ball and a micrometer being used to measure the internal threads

pitch diameters of the nuts with some assurance that they would provide a reasonably close fit without a preliminary trial. Lacking the equipment for applying the three-ball method (three-wire system for external threads), a substitute was found that suited the tools at hand or that were obtainable—a single ball corresponding to the best wire size, and an outside micrometer. The sketch illustrates the adaption.

Notations:

$O.\ D.$ = outside diameter.

m = measurement over a single ball.

$I.\ M. = O.\ D. - 2m$, equivalent to inside measurement between opposite balls.

By N.S.T.C. thread symbols:

D = major diameter

E = pitch diameter

$G = 0.57735p$ for best size ball diameter.

Then by the three-wire formula for internal threads E measured $= I.\ M. + 3G - 0.866p$. Substituting one of the actual sizes (1¼ in., 7 threads per in.), with an actual pitch diameter of 1.152 in. and adding the half-tolerance (0.003 in.) made the objective for E diameter 1.155 in., and from that the formula was evaluated for the nearest fractional ball-diameter of $\frac{3}{32}$ in. as follows: 1.155 in. = (3 in. − $2m$) + 0.281 in. − 0.124 in., or $2m$ = 3 in. − 1.155 in. + 0.281 in. − 0.124 in., and m = 1.001 inches.

This became our objective for the "cut to measure" fits for the ring nuts. However, the hexagon nuts lacked reliable concentricity and it became necessary to resolve m into two opposite measurements. Scribing a line across the flats, using a square, m was corrected at the first trial, and m_1 on one side and m_2 on the opposite side, determined by the eccentricity of the holes was substituted thereafter for $2m$.

While no complaint was made of the fits, the tolerance proved to be too close for some of the bolt threads and they had to be dressed to remove irregularities. In this case, "Try anything once" was a good motto.

At another time a job came in from a garage for a wheel-puller for a 3-in. wheel hub having 14 threads per in., the wheel being located about five miles away. The m measurement was found to be 0.789 in. with no allowance. The puller was made and sent to the garage, but we have had no word regarding it. In this case, we think that "No news is good news."

Keeping Bar Stock Off the Floor

CHARLES F. OLIVER

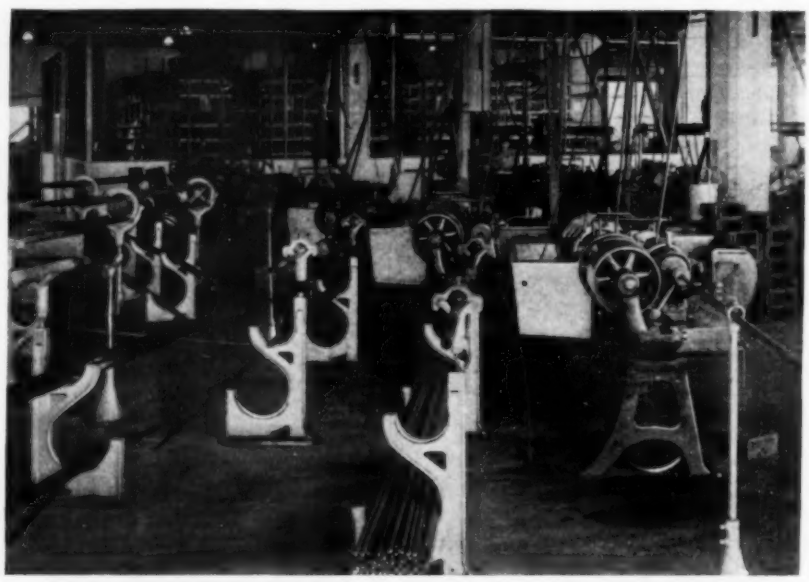
The automatic screw machine at the right of the illustration is equipped with a standard bar holder and guard. Such an arrangement provides no place for carrying bar stock and it is usually placed on the floor. The screw machine to the left of the one mentioned is equipped with a combination stock rack and bar holder and is more convenient and sightly in every way. The pipe holder at the top of the rack can be made to take any size of pipe up to 3 in. as was done in this case, or it can be made lighter to take specific sizes only. No matter how badly the stock whips, it cannot upset one of these standards.

A Non-Rigid Back Rest for the Screw Machine

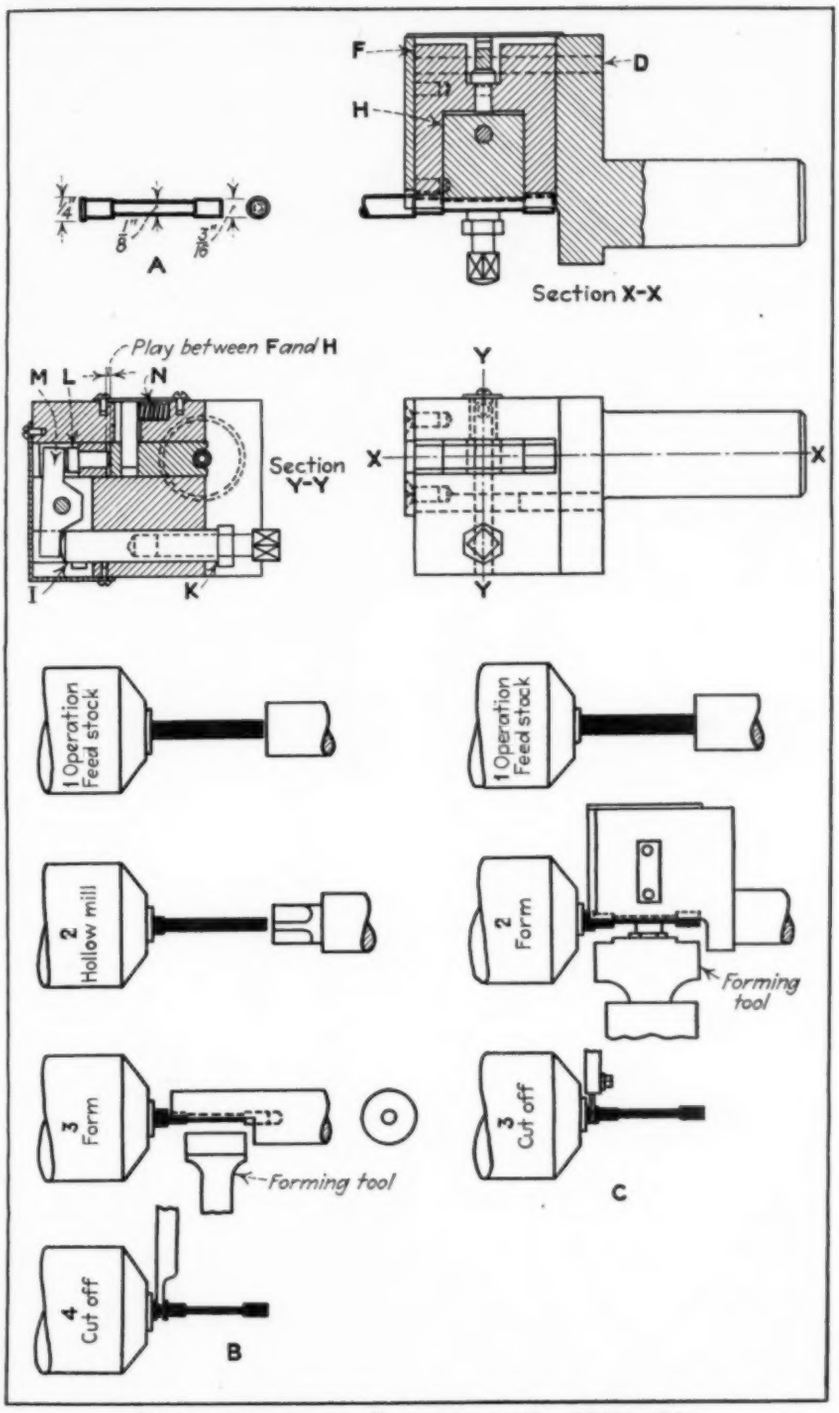
EMIL WITTMANN

The work shown at *A* in the illustration was made from Everdur in a screw machine in four operations, as indicated at *B*. Forming the ⅛ in. diameter in the third operation restricted the output to 40 pieces per hour because the forming tool had to be fed very slowly and carefully to prevent chatter and deflection of the slender work, which was not properly backed up at the point where it was most needed. To increase production and lower the cost of manufacture, the non-rigid back rest illustrated was designed. In using this device, the sequence of operations was changed to that indicated at *C*, enabling production to be stepped up to 110 pieces per hour in three operations instead of four.

Essentially, the device consists of the body *D* having a shank to fit one of the holes in the turret; the supporting member *F* sliding in a slot in the body; the supporting member *H* sliding in member *F;* the pressure rod *I* fitted with the adjusting screw *K;* the pressure pin *L;* the swiveling member *M;* and the spring *N*.



Combining the standard screw-machine bar holder with a stock rack adds to both convenience and appearance of shop



Back rests are usually made rigid. Using this "follow-up" type of rest eliminated chatter and speeded up production from 40 to 110 per hour

In operation, after the turret has been advanced to the correct position, the toolblock carrying the forming tool is fed toward the work. Just before the forming tool contacts with the work, the toolblock contacts with the head of screw *K*, causing it to move the pressure rod *I* against one end of the swiveling member, the other end of which contacts with the pressure pin *L* and forces the supporting member *F* toward the work. At the instant the forming tool contacts with the work, the supporting member *F* also contacts with the work and backs it up under the pressure of the cut. When the forming tool starts to cut the $\frac{3}{16}$-in. diameter, the play between the supporting members is taken up, member *F* contacting with member *H* and moving it toward the work. Both members then move in unison until the forming cut has been completed, backing up the work at both diameters.

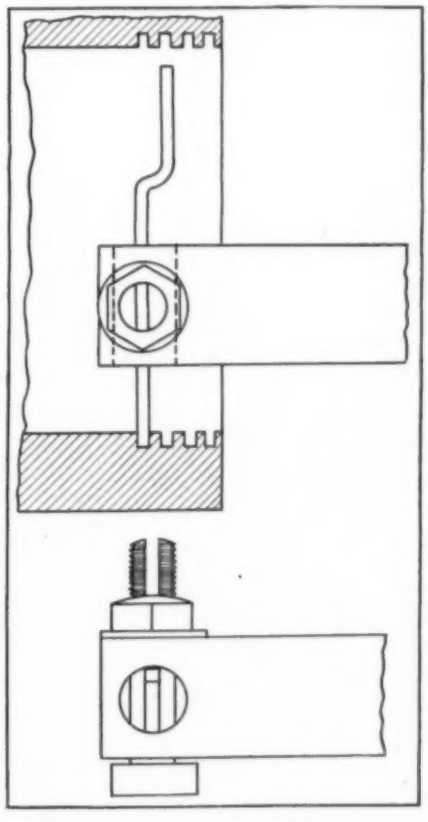
To regulate the pressure of the supporting members against the work, the screw *K* is turned to the right or left and is locked by a locknut. When the head of screw *K* is not in contact with the toolblock, the spring *N* pushes the supporting members back, clearing the work while the turret is being advanced or withdrawn.

Tool for Spacing Grooves

N. M. MOORE
Hamilton, Ontario, Canada

An experimental job required a small cylinder having a number of annular grooves in the interior, the grooves to be equally spaced. The tool used was a blade of the correct thickness taken from a parting tool and held by a slotted bolt in a holder made as shown in the illustration.

After the first groove had been cut, the lathe was stopped and the toolblock was moved back, freeing the tool from the groove. For spacing the next groove, the toolblock was moved back on the cross slide and the carriage was traversed toward the headstock until the offset end of the tool could be entered in the groove just cut. The toolblock was then moved forward, freeing the offset end of the tool from the groove. With the tool so positioned, the lathe was started and the second groove was cut.



The grooves were spaced by entering the offset end of the tool in the last groove cut

Quick-Acting Clamps

C. F. STAPLES

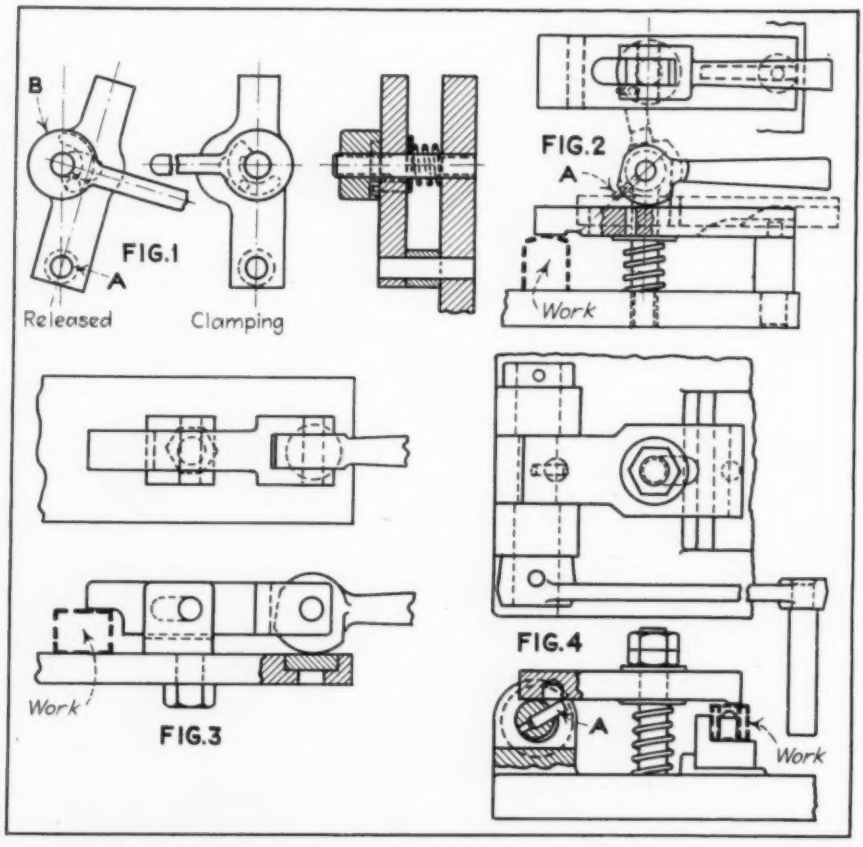
A swinging clamp for use where the work is placed over a locating pin, or where there is not room to operate a sliding clamp is shown in Fig. 1. The clamp is pivoted at *A*, and in the under side of the wingnut *B* is a concentric slot terminating at one end in a short, radial slot. A small pin in the clamp engages this slot.

By rotating the wingnut to the right, the clamp will be swung into clamping position by the pin *A* engaging the radial slot. Continued rotation of the wingnut will bring the clamp down on the work. Rotating the wingnut in the opposite direction will release the clamp and swing it into the released position. This clamp should not be used on work having a variation in thickness greater than one-half the lead of the thread on the bolt.

A cam-operated sliding clamp is shown in Fig. 2. When the cam is rotated to the left, the first few degrees of rotation will release the work. Continued rotation will cause the pin *A* to engage a hole in the clamp and slide the clamp to the right, clearing the work. If the cam is rotated to the right, the pin *A* will again engage the hole in the clamp, moving the clamp to the left and over the work. Further rotation of the cam will bring the toe of the clamp down on the work and hold it securely.

Another cam-operated sliding clamp is illustrated in Fig. 3. The cam is at the heel of the clamp and bears on a hardened insert. In this clamp, the cam is used only for clamping the work, the sliding being done by the operator.

The clamp in Fig. 4 is operated by an eccentric under its heel. When the eccentric is rotated to the left, the heel of the clamp is lowered and the toe is raised, releasing the pressure on the work. On further rotation of the eccentric, the pin *A* in the eccentric engages a hole in the clamp and slides the clamp to the left, clearing the work. Rotating the eccentric in the opposite direction will slide the clamp over the work.



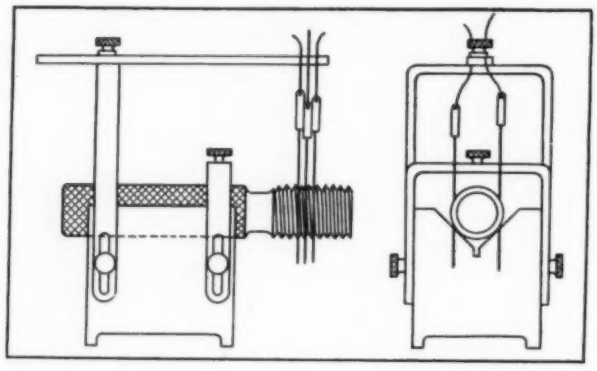
Quick-acting clamps are a necessity where production costs are important. This shows several types and some of their applications

Holding Work and Wires for Thread Measuring

CHARLES KUGLER

The fixture illustrated is for holding the work and the wires while measuring threads by the three-wire system and is useful in shops that have no special measuring machine for this kind of work. In the absence of such a machine, the general practice is to hold the work in the bench vise and to hold the measuring wires in place with strings or rubber bands.

The fixture consists of a V-block, an adjustable clamp and two adjustable brackets. One end of the work is clamped in the V-block and the measuring wires are suspended from the upper bracket, which has saw cuts for the suspension wires or strings to slip into. Thus, the hands are left free for manipulating the micrometer. The handles or grip ends of the measuring wires are drilled for the suspension wires or strings.



The hands are free for manipulating the micrometer

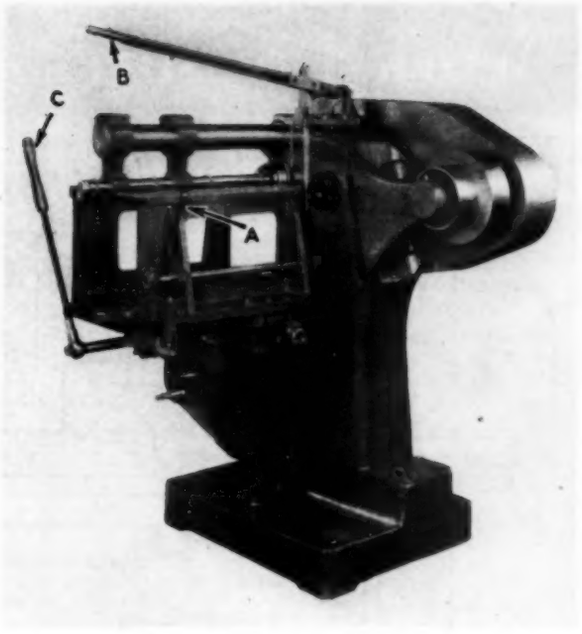
Large Work in a Hand Miller

EDMUND E. BURKE

Kent-Owens Machine Company

The problem in the work to be done in the machine illustrated was not one of machine power, but rather to find some means for holding rather large, bulky castings on which light cuts were to be taken. The castings are held in a simple fixture in a plain, hand-operated milling machine, the fixture being shown without the work.

Eight $\frac{3}{8}$-in. slots are to be milled in the main bearings of four-cylinder engine blocks, four slots on each side. With the head of the machine raised so that the cutters will clear the work, a cylinder block is slid endwise into the fixture and against a stop at the back. The lever *A* is then swung to the right, raising the cylinder block by means of cams and equalizing levers at both back and front, and clamping it against the under-



Hand milling machines are very convenient on work within their capacity. This shows how an unusually large job was handled without difficulty and at low cost

sides of locating plates attached to the top of the fixture.

The head of the machine is then fed downward against a stop and the four cutters mill four slots at one side of the bearings. A special operating device for the head is used, the extra-long lever *B* being provided to be within convenient reach of the operator. Traversing the table against a stop by the lever *C*, causes the cutters to mill four slots in the opposite sides of the bearings.

It will be noted that all the movements are by hand, permitting the use of a hand-operated milling machine and a simple fixture, thus keeping down the investment cost. Production is at the rate of 72 cylinder blocks per hour.

●

SEEN AND HEARD

JOHN R. GODFREY

Consulting the Shop Man

Work councils, company unions and outside federations are again in the limelight, and as usual there is wide diversity of opinions. These vary from feudal and frequently benevolent despotism to complete industrial democracy where no move is made without a vote of the men. As is usually the case, neither extreme gives best results. Few shop men want the responsibility of most management problems. When these problems vitally concern the men they naturally like to be kept informed, and consulted before decisions are made, if possible. They like to feel that they are a factor in the organization, but have no wish to dominate it. This, of course, assumes that the men feel confidence in the management and feel that they have had a fair deal. In other words it is another question of management. Where management has raised its own salaries while cutting the men, which has been done in a few cases, men naturally demand a change. But when, as in most cases, management has played fair, it has nothing to fear from workers' councils.

Good Men Don't Hurry

While many things in the shop have changed materially since I learned the trade, some seem to remain the same. Our fastest Fox lathe man never appeared to be in a hurry. Some would rush and tear, while he went steadily on, piling up the work. In a southern shop the other day the foreman pointed out a man and said, "Best J. & L. man south of the Mason-Dixon line. He never hurries but he gets out the work. The best men I know never hurry, but they make every move count." My old shop mate never heard of motion study and it's doubtful if the other man had either. But motion pictures of either man would help a lot in teaching young men how to handle their work.

A Clutch That Didn't Slip

Friction clutches sometimes get a bad name because of slippage. Frequently that is one of their advantages as they act as a safety valve to prevent damage to a machine. Sometimes they carry a load that is almost unbelievable. A recent case was a test of an automobile clutch to see how it held under load. The result was that the 1½-in. splined shaft at the expense of the tires. But looked like a helical reamer. In a car the wheels would spin and save the shaft at the expense of the tires. But it showed that clutch surfaces have a very high coefficient of friction.

Instruction by Motion Picture

Haven't we been passing up a lot of possibilities by not using motion pictures for instruction in shop work? We know of a case where the nurse left suddenly, before the young mother had ever bathed the baby. But dad was a movie hound and had taken the whole operation, from start to finish. So when nurse lit out they set up the projector and ran the reel through and the baby got her bath without missing a trick. If I were selling machinery to countries that were shy on trained mechanics, I'd send along a reel of slow-motion pictures showing how the machine worked on jobs similar to those for which it was intended. Pictures speak a universal language and have an instruction book skinned to death.

Grinding Scrapers Right

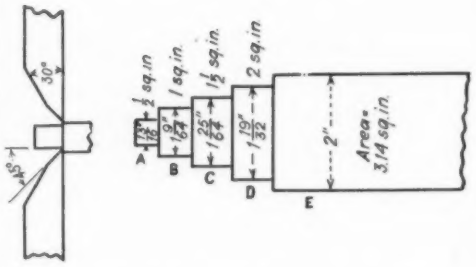
Many old time scrapers were made by breaking the end from an old file and grinding the sides until all semblance of the teeth had disappeared. The end was ground square or at an angle, according to the ideas of the user. Then scrapers were forged on the end of a flat bar and made in various shapes and sizes. But they were usually ground by hand on a grindstone or emery wheel. Now scraper grinding is a toolroom job in some shops. The tool is held in a rest and the scraping edge ground flat with a cup wheel. This gives a surface that is really flat and should help the work considerably.

How Other Industries Affect Us

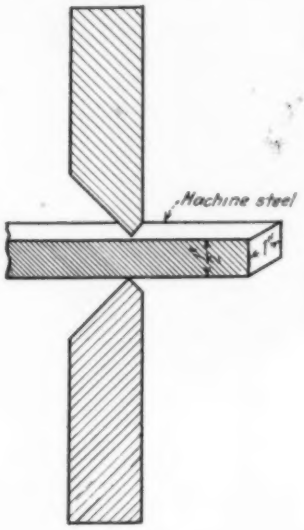
Sometimes it's the little things we don't know about that balk our designs for a successful machine. A case in point is a special marking device for cloth. It worked satisfactorily so far as the machine was concerned. But the ink for marking was another story. It must be indelible and have other characteristics that could not be met by any ink then available. Of course the chemists will lick the job and everything will work out O.K. but the reason for the delay in marketing the device was never thought of in the beginning. All of which is another example of the way in which various industries tie with each other.

Press Work Pressures

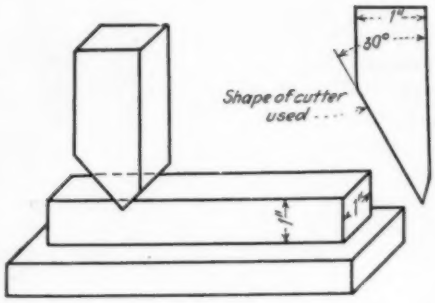
Series XXVIII—*Sprue Cutting*



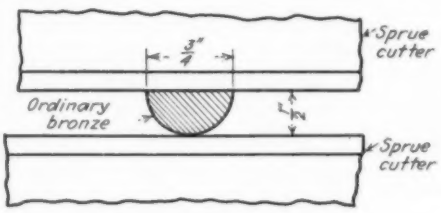
Material--Cast bronze bar
Operation--Cut off at various diameters
Pressure--7,200 lb. to cut off at A
11,500 " " " " " B
17,000 " " " " " C
24,600 " " " " " D
25,200 " " " " " E



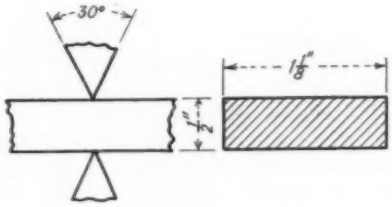
Material--Ordinary machine steel, 1/2 by 1 in.
Operation--Cut with sprue cutters
Pressure--20,000 lb.



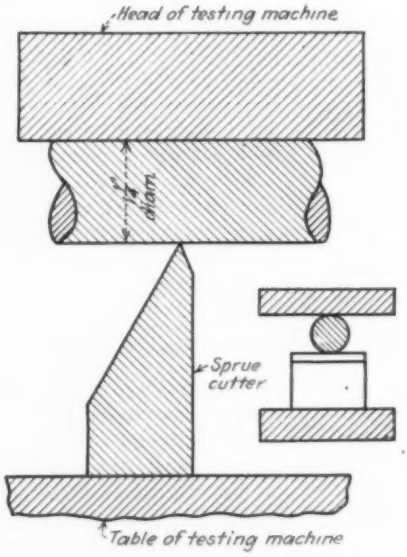
Material--Machine steel, 1 by 1 in.
Operation--Cut with a sprue cutter
Pressure--62,000 lb.



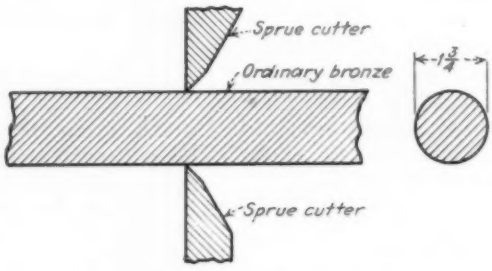
Material--Ordinary bronze, 3/4 in. in diameter
Operation--Cut apart
Pressure--5,600 lb.



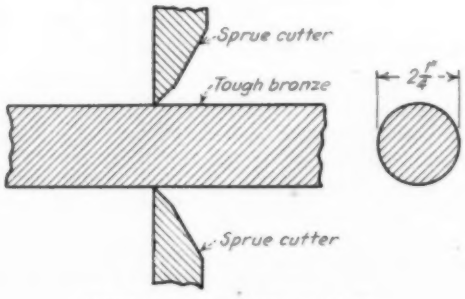
Material--Chromium-nickel steel bar, 1/2 by 1-1/8 in.
Operation--Cut bar. The bar parted when the blades were 3/16 in. apart
Pressure--29,500 lb.



Material--Machine steel and iron, 1-1/4 in. in diameter
Operation--Cut iron and machine steel bars with a single sprue cutter, also machine steel bar of the same diameter with two sprue cutters
Pressure--Iron bar 1-1/4 in. diameter-30 tons
Machine steel 1-1/4 in. diameter-43 tons
Machine steel two cutters - 32 tons



Material--Ordinary bronze, 1-3/4 in. in diameter
Operation--Cut with sprue cutters
Pressure--81,000 lb.



Material--Tough bronze, 2-1/4 in. in diameter
Operation--Cut apart
Pressure--84,800 lb.

Contributed by C. W. LUCAS

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Press Work Pressures

Series XXIX— *Shearing*

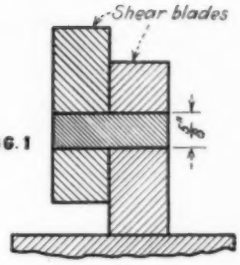


FIG. 1

Material--Brass, 5/8 in. in diameter
Operation--Shear bar
Pressure--Hard brass, 11,250 lb.
Soft brass, 9,400 lb.

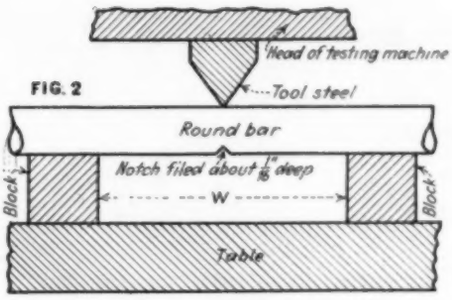
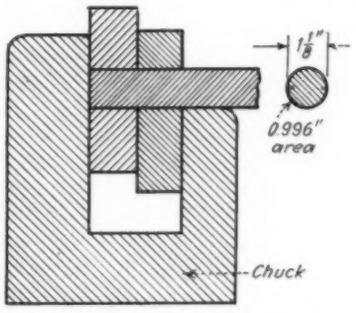
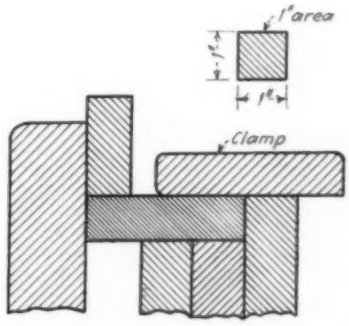


FIG. 2

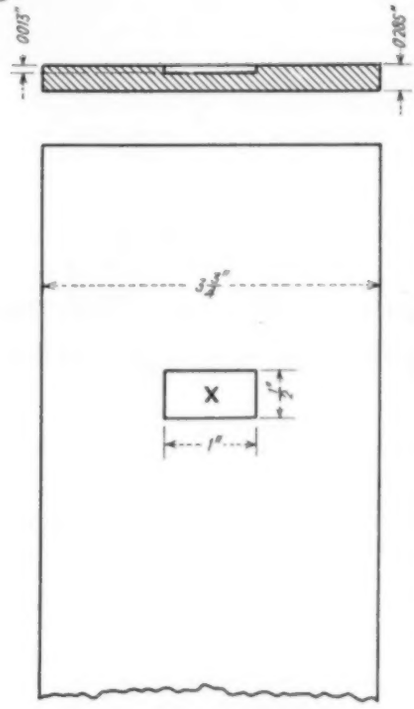
Material--Round, unannealed tool steel
A - 1 in.
B - 1-1/2 in.
C - 2 in.
Operation--Obtain pressures required for shearing and breaking tool-steel bars of various diameters. Shearing as in Fig. 1, breaking as shown in Fig. 2
Pressure--A- to shear, 51 tons,
to break, 6 tons, W = 6 in.
B- to shear, 115 tons,
to break, 12 tons, W = 9 in.
C- to shear, 204 tons,
to break, 15 tons, W = 12 in.



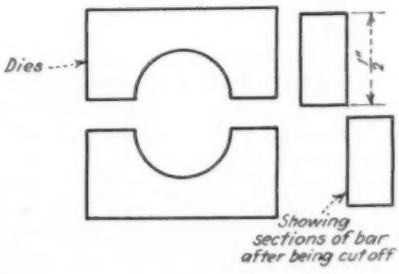
Material--Machine steel bar 1-1/8 in. in diameter
Operation--Cut off area approximately 1 sq. in.
Pressure--47,000 lb.
See test at right on square bar of equal area



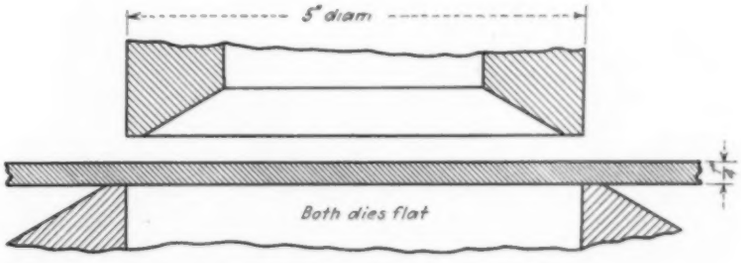
Material--Machine steel bar, 1 in. square
Operation--Cut off
Pressure--49,600 lb. for square bar



Material--SAE 3120 steel, 0.235 in. thick
Operation--Comparing pressure required to cut 1 sq. in. of this steel with ordinary machine steel. Also pressure required to sink a hardened die into the steel plate at X
Pressure--SAE steel - 26 tons to cut off 1 sq. in.
Machine steel - 25.3 tons
To sink die to depth of 0.013 in. - 35 tons
To sink die to depth of 0.017 in. - 50 tons



Material--Hard-bronze rod, 1/2 in. in diameter
Operation--Cut apart
Pressure--8,200 lb.



Material--Soft machine steel, 1/4 in. thick
Operation--Shear a 5-in. blank
Pressure--Dies without shear - 118 tons
Dies with 1/4 in. shear - 60 tons
*Dies with 3/8 in. shear - 37.5 tons

*Shear equal to 1-1/2 times metal thickness

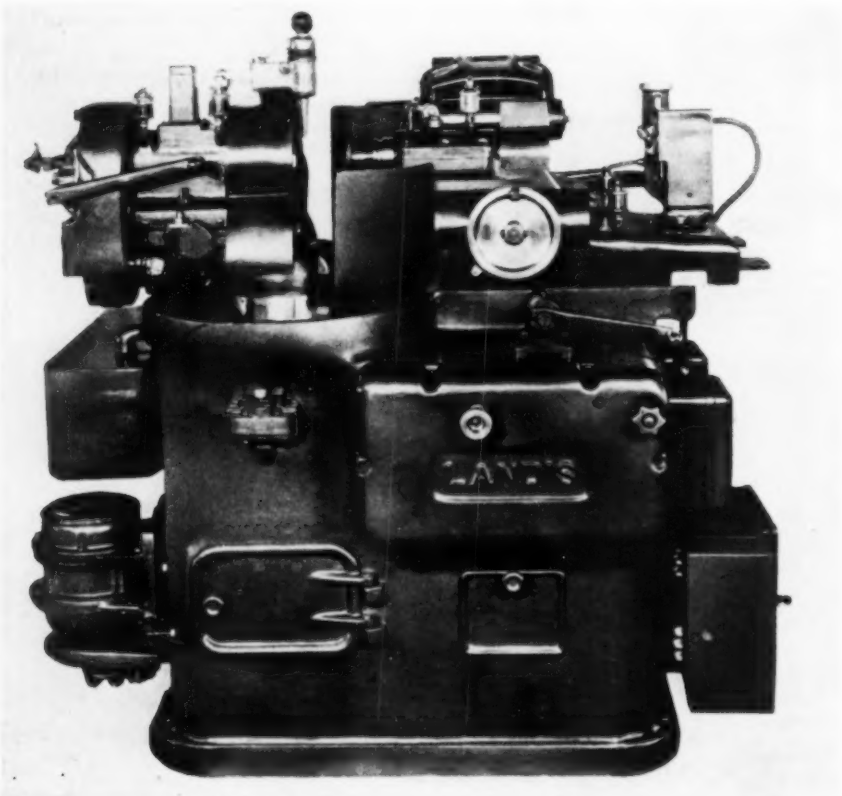
Contributed by C. W. LUCAS © American Machinist

SHOP EQUIPMENT NEWS

Landis 3½-In. Hydraulic Internal Race Grinder

The 3½-in. hydraulic internal race grinder offered by the Landis Tool Co., Waynesboro, Pa., operates automatically except for loading and unloading. This automatic operation is controlled by the air-sizing device (*AM*—Vol. 78, p. 670). The capacity of the standard machine is such as to grind all the smaller sizes up to and including the 212, 311 and 409 groups. Not only can the machine be used for single-row races but also for double-row races and thrust races within the same size range. Larger races may be handled by removing the sizing device and certain other parts and then operating the machine by hand.

The operator places a ring in the chuck and traverses the grinding wheel into the work. As soon as the wheel reaches the grinding position the work starts rotating, the head starts oscillating and the wheel automatically rapid feeds into grinding contact with the race. The hydraulic feed mechanism then comes into play and feeds the wheel at a predetermined roughing rate.



Single-row and double-row races and thrust races can be ground on the Landis 3½-In. Hydraulic Internal Race Grinder

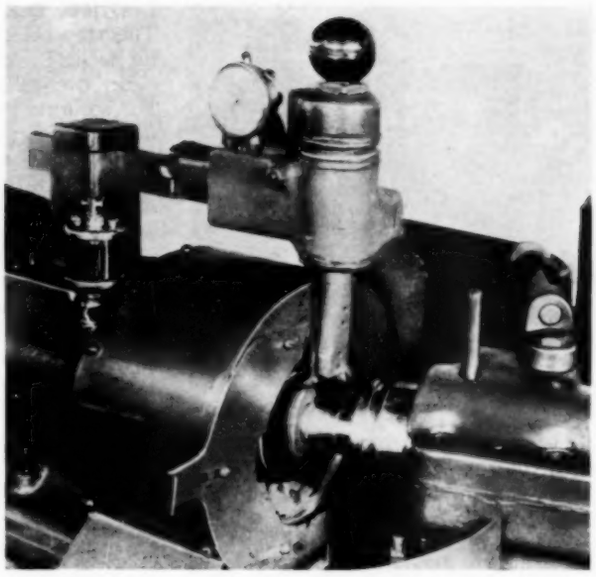
When the work is rough ground to within a thousandth of finish size, the amount being adjustable, the feed is automatically cut down to a very fine finishing rate. Coolant con be automatically cut off at this point for a dry finishing operation, if desired. As soon as the race reaches finish size, the wheel automatically backs away enough so that it may be removed from the race. The oscillation then stops. The operator then traverses the wheel out of the race, removes the sizing device and reloads. The machine has been designed to grind with as rapid a cut as the grinding wheel will stand up under and then to finish smoothly under a light feed.

The oscillating head is mounted on two large pre-loaded ball bearings and is oscillated by a hydraulic vane-type motor in which impulses are balanced. The oscillating head is graduated in degrees with zero corresponding to the central position. As a result, the operator can set the head to oscillate an equal amount either side of center, or the correct amount either side of center for non-symmetrical races. The whole hydraulic motor and head is turned 90 deg. for grinding thrust races, and the head is capable of oscillating in this position with the center line of oscillation at 90 deg. to the wheel-spindle axis.

Drive to the workhead is by a ¾-hp. vertical motor at the left-hand end of the bed. A standard V-belt connects this motor to a vertical shaft running up through the center of the oscillating spindle. At the top of this shaft is a worm that drives a horizontal shaft at the left end of the lower workhead slide. On the end of this shaft is a pulley for a flat leather belt to drive the workhead spindle. The work speed is changed by changing the pulleys and belts.

The workhead is mounted on two dovetail slides at right angles to each other. The lower slide is adjusted by a screw for placing the work center at the correct distance from the oscillating center for generating the correct race curvature. The upper slide is moved parallel to the work axis by a worm which drives a rack and pinion for centering the groove in the ring. For grinding double-row races a lever is substituted for the worm and gear, and the slide may be moved rapidly between two adjustable stops. Thus, both races are ground at the same setting, accurately spaced and centered in the ring.

Three feeding movements are automatically imparted to the wheel. First



Close-up of the air-sizing device in the operative position

the wheel feeds rapidly into grinding contact, then an hydraulic feed regulator comes into play and feeds the wheel at a roughing rate. At a predetermined point on an impulse from the sizing device this regulator changes the feed to a slow finishing rate.

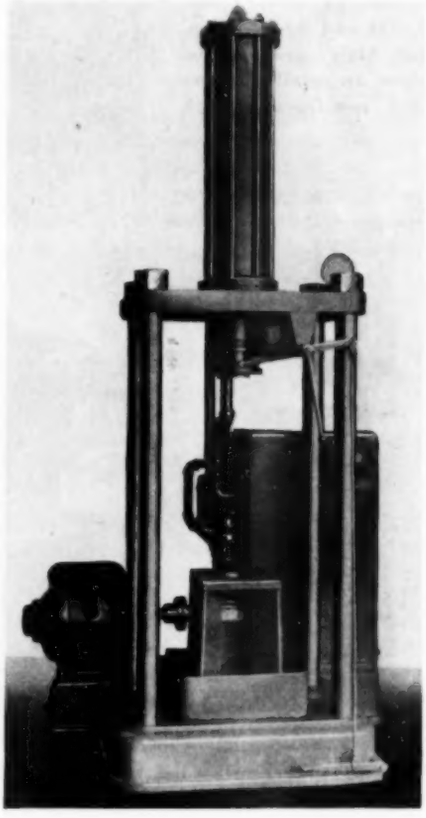
"Amolastic" Floor-Repair Material

A mastic compound added cold to sand, cement, gravel or traprock, for repair of broken floor surfaces in industrial plants has been developed by the Floor Treatment Division of the American Oil & Disinfectant Company, 129 E. 26th St., New York, N. Y. By adding more or less of these admixtures to Amolastic, a surface as soft as rubber for foot traffic or as hard as concrete for heavily loaded trucks can be produced. The material will bond to concrete, wood, asphalt, composition or brick floors.

American Hydraulic Utility Presses

Hydraulic utility presses in 25- and 50-ton models have been placed on the market by the American Broach & Machine Co., Ann Arbor, Mich. The 25-ton machine has a downward speed of 18 ft. per min., and a return rate of 22 ft. per min. Maximum daylight between ram and table is 62 in., and the stroke is 36 in. Automatic stop collars can be adjusted to allow the ram to move to any stroke desired. For the 50-ton press the down speed is 9 ft. per min., and return speed is 12 ft. per min., while the other specifications are the same as for the 25-ton machine.

A worktable can be furnished for broaching operations, as shown. Hydraulic pressure is generated by the high-pressure pumping system fitted to the machine, a balanced piston valve controlling the movement of the ram. Foot pedal and hand lever controls are fitted, and are so arranged that the ram always returns to the upper or starting position after each stroke. The control is such that the ram can be inched or given a full stroke by movement of either lever.



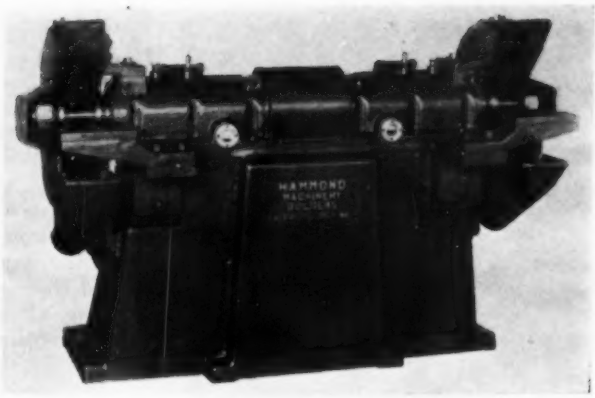
Waldron Torque-Ring Coupling

Smith & Serrell, general sales agents, 30 Washington Pl., Newark, N. J., and the John Waldron Corp., New Brunswick, N. J., have developed an all-steel lubricated gear-type coupling known as the "Waldron Torque Ring Coupling." When the connector shafts become misaligned there are four points within the coupling at which relative movement can take place. Each torque ring (2)

can tilt and can slide endwise with respect to its hub member (1), and the torque rings and hubs can also tilt and can move endwise within the single-piece cover sleeve (3). The external teeth of hubs and torque ring gears (2) are spherically crowned in order to locate and to hold the torque rings and the cover sleeve (3) concentric with the hubs. Fifteen regular sizes are listed for shafts from 1⅞ to 12 in. in diameter and with ratings from 22½ to 4,840 hp. per 100 r.p.m.

Hammond Model 10 WWH High-Speed Grinder

Two arrangements of the Model 10 WWH high-speed grinder are offered by the Hammond Machinery Builders, Inc., Kalamazoo, Mich. In the first arrangement a single motor up to 15 hp. in size is employed. The two inner ends of the spindles are coupled together by a



High-speed wheels are used on this Hammond Model 10 WWH Grinder. A single motor drive gives the same speed to both wheels; double motor drive allows different speeds to the two wheels

combination coupling and V-belt pulley, making it possible to remove the V-belts without removing the spindles from the bearing housings. In the second arrangement the spindles are independent, each being driven by its own motor at the required speed.

The spindles are mounted on ball or roller bearings and are provided with either a plain oiling system or with a Cascade oiling system pumping filtered oil. Work rests are equipped with removable plates. Boiler plate steel wheel guards are provided.

Warner & Swasey No. 1, 5/8 x 4-In. Electric Turret Lathe

A high-speed turret lathe, utilizing the motor-on-spindle construction, and incorporating an improved bar feed, has been brought out by the Warner & Swasey Co., Cleveland, Ohio. This No. 1 machine has capacity for round stock up to 5/8 in., and a bar feed of 4 in.

A rotor is mounted directly on the spindle, while the stator is in the head housing, as shown in Fig. 2. Four speeds are available in either direction, 600, 1,200, 1,800 and 3,600 r.p.m. Perfect balance is obtained. Fan blades, attached to the rotor, circulate air at high velocity through cored passages around the spindle bearings and motor windings.

Two levers control the spindle through a drum-type controller and automatic relays. The shorter lever selects the four spindle speeds, while the longer lever stops, starts and reverses the spindle. An ample number of reversals per minute is permissible. A large band brake is actuated by the longer lever in the neutral position to prevent rotation when attaching chucks and loading work.

The improved bar feed holds the bar in a concentric position in the spindle to prevent vibration, and the bar is protected for practically its entire length in a tube for safety. The friction feed finger lies immediately behind the collet bore, so that the bar stock can be used up to the last end. The finger is mounted on a feed tube which, at the rear of the spindle, is reciprocated by a fork. Simple hand lever action and toggle linkage feeds the stock, closes the collet and returns the feed finger. Length of feed is controlled by a collar. This stop collar gives sufficient accuracy for feeding work that does not require closer over-all dimensions than 1/64 in. For accurate lengths a stock stop is also used in a hexagon turret. Balance at high speed is secured by supporting the bar stock in the spindle by a removable filler tube. The time required for inserting a fresh bar has been reduced. The bar support tube can be swung toward the operator to slide in a new bar from the spindle end.

Specifications: Swing—over bed, 11 in., over cross-slide, 4¼ in.; cross-slide travel, total 4½ in.; turret dimensions—round turret diameter, 5½ in., six tool holes, ¾ in. in diameter; effective turning movement of turret at any setting of saddle along bed, 4 in.; greatest distance, end of spindle to turret face, 12½ in.; automatic chuck capacity—round, 5/8 in., square 7/16 in., hexagon, ½ in.; bar feed capacity — maximum single-feed stroke, 4 in., maximum bar length, 12 ft.; net weight 1,230 lb.; floor space, machine only, 2 ft. x 5 ft. 10 in.; extension of bar support tube, 9 ft. 3 in.

Stronger construction is used for the cross slide, and the cross feed steps are

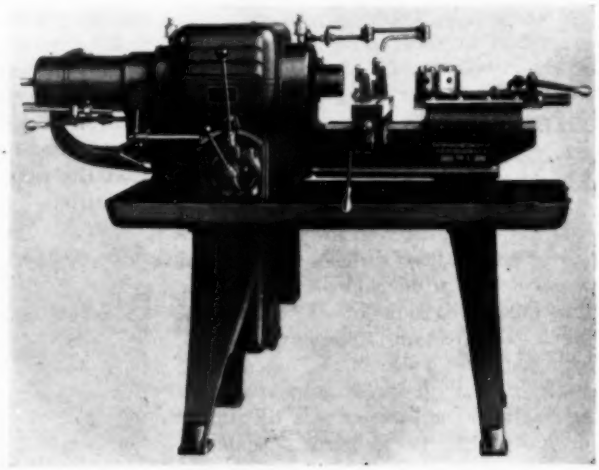


Fig. 1 — Warner & Swasey No. 1, 5/8x4-In. Electric Turret Lathe with four spindle speeds of 600, 1,200, 1,800 and 3,600 r.p.m. for high speed operations on small-diameter and non-ferrous work

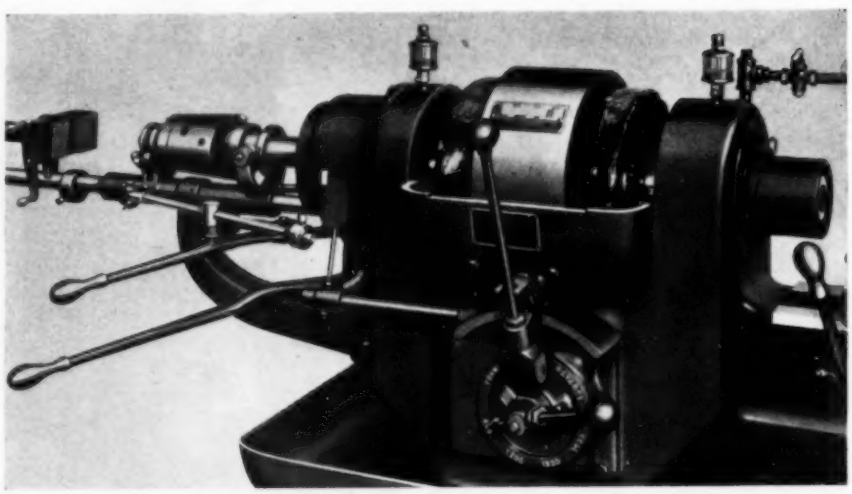
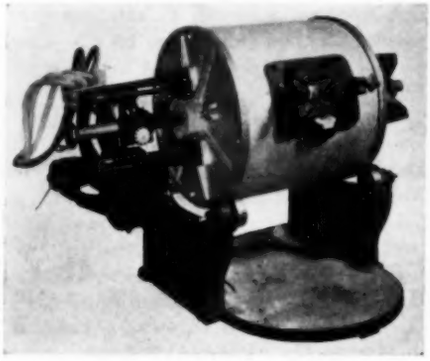


Fig. 2—Close-up of machine with head cover removed, showing the motor in place, and also details of the improved high-speed bar feed

of rigid construction so that work limits of 0.001 in. in diameter can be held readily when forming. Block-type, open-side toolposts are employed and have screw-actuated tool elevating wedges. Either a lever or a screw-feed action can be furnished for the cross-slide, or it can be furnished so that both are available in the same slide.

Detroit Small Electric Furnace

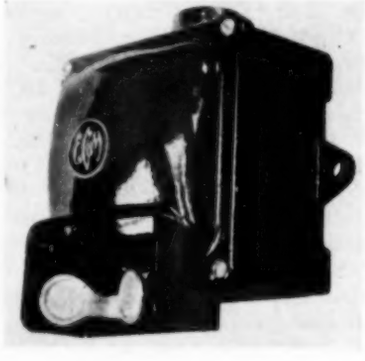
A rocking electric furnace of 25 to 100 lb. capacity has been announced by the Detroit Electric Furnace Co., 825 West Elizabeth St., Detroit, Mich. The unit has been designed for either production or experimental melting of



small-lot runs of such metals as iron, alloy steel, copper, brass, nickel, aluminum or precious metals. It is completely equipped with transformer, control panel, switches, meters and rocking mechanism. Nominal electrical rating of the furnace is 20 kw.

"EC&M" Vapor-Proof Safety Pushbutton

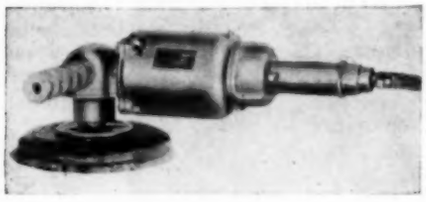
For use in connection with the remote control of automatic motor starters, the Electric Controller & Manufacturing Co., 2705 East 79th Street, Cleveland, Ohio, has announced a 270-A, Type J, Form C vapor-proof and dust-tight, safety lock-out pushbutton. This device is for



3-wire, low-voltage protection of installations, where it is desired to start and stop a motor through its magnetically-operated starter or controller from two or more pushbutton control stations. At any one of these stations it may be desired to lock the pushbutton in the "off" position to prevent operation of the machine. Insertion of a padlock on the stop side of the pushbutton will prevent operation of the machine until the authorized person has removed the padlock and re-established the control circuit.

Buckeye High-Frequency Polishing and Sanding Portable Tools

The Buckeye Portable Tool Co., Dayton, Ohio, has developed two high-frequency electric portable tools as follows: No. 57-1800 polishing and rubbing tool, and No. 56-4700 sander. The



first is used for rubbing down and polishing lacquer. Specifications are as follows: 2-phase, 180 cycles, 225 volts; speed, 1,800 r.p.m.; capacity, 8- to 9-in. disks with rubbing pad or lamb's wool; overall length, 16¼ in., weight, 10½ lb. The sander is identical in construction with the No. 57 tool, but runs at 4,700 r.p.m., and is equipped for sanding or grinding with abrasive disks or cup emery wheels.

This tool is powered by a high-frequency motor and the handles are insulated from the body. A ventilating system prevents the exhaust from blowing in the face of the operator.

• TRADE • PUBLICATIONS

BALL BEARINGS. The ninth edition of its ball bearing catalog has been published by the New Departure Mfg. Co., Bristol, Conn. The catalog contains new bearing types, new list prices and additional sizes of existing types. Other information consists of: bearing design and load characteristics, typical mounting designs, factors for the selection of bearings at electric motor speeds, factors for selecting bearings for speeds down to 10 r.p.m. and fits and weights for all bearings.

COMPRESSORS. Type XVG direct-connected gas-engine-driven compressors for air and gas are described in Form 3065, available from Ingersoll-Rand Co., 11 Broadway, New York, N. Y.

CUTTING MATERIAL. The American Cutting Alloys, Inc., 347 Madison Ave., New York, N. Y., has published a booklet on "Cutanit," a titanium-carbide hard metal for machining steel and other materials. Examples of performance in ordinary shop practice are given, rules for the use of the material, suggested speeds and feeds, grinding of tools, and standard tools available.

FASTENINGS. In its 4th edition of "Parker-Kalon Products," the Parker-Kalon Corp., 200 Varick St., New York, N. Y., presents complete information and technical data relating to the use of its various types of screws and nails. Relative strengths of fastenings made with these products as compared with standard screws and nails are given in detail.

FLEXIBLE COUPLINGS. The Poole Foundry & Machine Co., Woodberry, Baltimore, Md., has published a catalog on flexible couplings, the catalog being complete with horsepower ratings, maximum speeds, dimensions and weights. Unusual designs and types that have not been listed heretofore are shown.

FURNACES. The "Hyro" automatic furnace for casehardening is described in a booklet available from the Parker-Kalon Corp., 200 Varick St., New York, N. Y. The booklet shows the several models built and lists the specifications for standard equipment.

GRINDERS AND TAPS. The Geometric Tool Co., New Haven, Conn., has issued circulars on the No. 10 chaser grinder and the Style E universal chaser grinding fixture, and also a circular on Type SL collapsing taps for small holes.

INFLATION DELAYS RECOVERY. No. 5 in a series of booklets published by the Farrell-Birmingham Co., Ansonia, Conn., is entitled "Inflation Delays Recovery." This booklet states that the depression is a capital goods depression, and offers the opinion that until that industry is given freedom to revive in natural fashion there can be no such thing as recovery.

LATHES. A 72-page Catalog No. 94 showing its complete line of lathes and attachments for manufacturing production, machine shop, maintenance shop, tool room, electrical shop and laboratory uses has been published by the South Bend Lathe Works, South Bend, Ind. The catalog describes and prices 96 sizes and types of lathes.

MACHINE GAS CUTTING. Under this title the Air Reduction Sales Co., 60 East 42nd St., New York, N. Y., presents a 92-page book on machine gas cutting. The book discusses the greater latitude in design with this process and the greater speed of production, the smoothness and depth of cut and the types of steels that can be cut, and costs. Following are several pages thoroughly illustrating the types of equipment for which the process has been used. Last are presented descriptions of the various types of machines built for machine gas cutting. The book represents, perhaps, the first presentation of the salient facts about the machine gas cutting process and the machines themselves.

MOTORS. Leaflet 20530-B, issued by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., describes the complete line of explosion-resisting motors in ratings up to 200 hp.

MOTORS. Bulletin No. 505-C published by the Louis Allis Co., Milwaukee, Wis., shows detailed construction of its motors and illustrates the characteristics and uses of a dozen different types.

MOTORS. Catalog No. 33, issued by the Marble-Card Electric Co., Gladstone, Mich., shows various types of motors the company manufactures.

MOTOR BASES. The Rockwood Manufacturing Co., Indianapolis, Ind., has issued several folders describing its motor bases for ordinary horizontal drives, vertical drives, ceiling drives, and for small motors.

MOTORIZED MACHINE TOOLS. A four-page circular entitled "Machine Tools," issued by the Wagner Electric Corp., St. Louis, Mo., illustrates honing, milling, drilling, reaming, tapping, threading, grinding and other machine tools operated by the company's totally inclosed fan-cooled Type CP motors.

OPTICAL GEAR TESTER. Catalog 563 of the Societe d'Instruments de Physique, Geneva, Switzerland, for which The R. Y. Ferner Co., 1133 Investment Bldg., Washington, D. C., is American representative, describes an apparatus for rapid tests on spur and helical gears between 0.16 and 4 in. in diameter and from 50 to 10 D. P. Readings of pitch and eccentricity are made from the projection of a rectangular shadow on a glass screen.

PRECISION MEASURING TOOLS. The Van Keuren Co., 12 Copeland St., Watertown, Boston, Mass., has published Catalog No. 29 on precision measuring tools, as follows: light wave equipments, reference gage blocks, working gage blocks, plug gages, thread measuring wires, gear-measuring wires, flat and cylindrical laps, shop triangles and light-wave flatness testers, micrometers and deflection bars.

THERMOMETERS AND PRESSURE GAGES. Catalog No. 6702, published by the Brown Instrument Co., Philadelphia, Pa., illustrates a new line of indicating, recording and controlling thermometers and pressure gages. The catalog comprises 80 well illustrated pages.

THREAD HANDBOOK. The Dardelet Threadlock Corp., 120 Broadway, New York, N. Y., has published a handbook that deals principally with the theory and design of the Dardelet threadlocking construction. A chapter of 55 pages contains tables on the proportions and weights of bolts, nuts and screws, including specifications and data for various materials. The handbook comprises 220, 4½ x 7-in. pages, and the price is $2.

USED MACHINERY. The Hill-Clarke Machinery Co., 649 Washington Blvd., Chicago, Ill., has published "The Green List" of "remanufactured" machinery.

WOOD PRESERVER. The Tennessee Eastman Corp., Kingsport, Tenn., published a circular on "No-D-K" wood preserver which may be applied by brush, spray or painting. The material is a highly concentrated creosote oil.

• PATENTS •

FEBRUARY 20, 1934

Metal-Working Machinery

Thread Tool Grinding Machine. John Edgar, Rockford, Ill., assigned to Barber-Colman Co. Patent 1,947,466.

Stock Gauge Stop for Machine Tools. Harry W. Rupple, Shaker Heights, Ohio, assigned to the Cleveland Automatic Machine Co. Patent 1,947,799.

Double Chuck Machine Tool. Harry W. Rupple, Shaker Heights, Ohio, assigned to the Cleveland Automatic Machine Co. Patent 1,947,800.

Lathe Drive. Lyndon C. Cole, Hamilton, Ohio, assigned to General Machinery Corp. Patent 1,947,829.

Special High-Speed Drive for the Spindle of Boring Machines or Other Machine Tools. Henry M. Lucas, Cleveland Heights, and Hallis N. Stephan, Cleveland, Ohio, assigned to the Lucas Machine Tool Co. Patent 1,947,862.

Power Press Control. Harry C. H. Walsh and Edward H. Hall, Chicago, Ill. Patent 1,947,892.

Centerless Work Feed. Herman Isler, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,948,113.

Machine Tool. Albert M. Johnson, Rockford, Ill., assigned to Barnes Drill Co. Patent 1,948,115.

Piston Milling and Turning Machine. Frank A. King, Lansing, Mich., assigned to General Motors Corp. Patent 1,948,236.

Honing Machine. John P. Ferris, Milwaukee, Wis., assigned to the Oilgear Co. Patent 1,948,468.

Tools and Attachments

Workholder. John R. Tillman, Bridgeport, Conn., assigned to the Bullard Co. Patent 1,947,957.

FEBRUARY 27, 1934

Metal-Working Machinery

Tracer Controlled Lathe. Frank O. Hoagland, West Hartford, Conn., assigned to Pratt & Whitney Co. Patent 1,948,617.

Interlocked Arm Clamp and Elevating Control. David C. Klausmeyer, Cincinnati, Ohio, assigned to the Cincinnati Bickford Tool Co. Patent 1,948,618.

Grinding Machine Having a Motor Driven Wheel Spindle. Howard W. Dunbar, Worcester, Mass., assigned to Norton Co. Patent 1,948,848.

Die Grinder. Ernest R. Jones, Detroit, Mich. Patent 1,948,859.

Car Wheel Grinding Machine. Charles H. Norton, Plainville, Conn., and Carl G. Flygare, Worcester, Mass., assigned to Norton Co. Patent 1,948,866.

Grinding Machine. Harold L. Blood, Worcester, Mass., assigned to the Heald Machine Co. Patent 1,948,899.

Grinding Machine. Waldo J. Guild, Worcester, Mass., assigned to the Heald Machine Co. Patent 1,948,914.

Grinding Machine. Richard A. Heald, Worcester, Mass., assigned to the Heald Machine Co. Patent 1,948,915.

Machine Tool Transmission and Control Mechanism. Joseph B. Armitage, Milwaukee, Wis., assigned to Kearney & Trecker Corp. Patent 1,949,097.

Grinding or Abrading Machine. Harry Hales Asbridge, Ashton-on-Mersey, England, assigned to the Churchill Machine Tool Co., Ltd., Broadheath, near Manchester, England. Patent 1,949,345.

Tools and Attachments

Milling Cutter. Alfred Buchmuller, Conz, near Trier, Germany, assigned forty per cent to Peter Zettelmeyer, Conz, twenty per cent to Mrs. M. Weber, twenty per cent to Mrs. Dr. E. Bichler, both of Trier, and twenty per cent to Mrs. Dr. H. Corsten, Berlin-Lichterfeld, Germany. Patent 1,948,648.

Cutter Truing Fixture. James E. Gleason and Schuyler H. Earl, Rochester, N. Y., assigned to Gleason Works. Patent 1,949,014.

Reamer. Gerard A. De Vlieg, Rockford, Ill. Patent 1,949,116.